MODERN Machine Shop

HOWARD CAMPBELL, Editor

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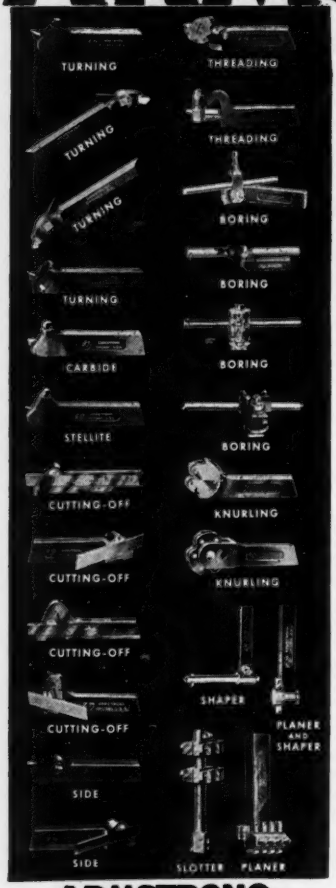

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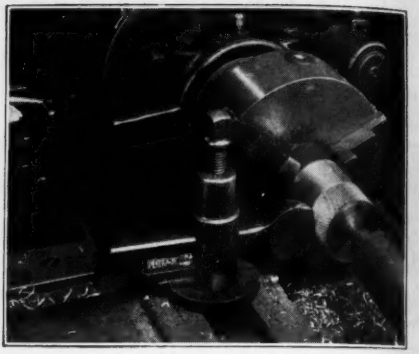

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CINCINNATI, OHIO VOL. 8, No. 5

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Wage payment

Incentives: An Evaluation of Economic and Social Aspects

This article is the first of a series dealing with the elimination of industrial waste through methods engineering. In subsequent articles the author will discuss the procedure involved in job analysis, time study, motion study, application of incentives to toolroom work, and so on.

BY H. B. MAYNARD
President, Methods Engineering Council, Inc., Pittsburgh, Pa.

IN considering the most desirable method of rewarding labor, the question must be approached from the viewpoints of the employer, the employee, and the consumer. The considerations which influence each individually are largely economic, while the conditions which influence all as a group are social.

The factor which chiefly influences the thinking of every employer is profit. Profit is whatever is obtained over the bare cost of operating a business. Without the opportunity for making a profit—however small—there can be no business and consequently no jobs. Thus the employer makes his decisions upon the basis of the effect they will have upon the profit which he ultimately expects to make. Some employers, often highly successful, stress service as being their chief aim, but behind this lies the knowledge that service properly given leads in the end to profits and thus to the perpetuation of the business.

The employer of labor is interested primarily in the return he gets from the money expended for wages as expressed by the unit cost of the product which he manufactures. He hires a man to perform a certain task, say the producing of a certain unit on a machine. The employer is interested in securing the maximum number of units at a minimum cost to himself, for low unit costs mean higher profits, either through higher unit profits or through greater volume

made possible by increased sales at a lower price. The employer may attain his end in two ways. He may pay the man a fixed wage and then, by close supervision — usually of a driving nature—see that he produces at a maximum rate, or he may pay a fixed amount per unit and allow the man's natural desire to earn as much money as possible to act as the spur towards maximum production. Other factors enter in, of course, but in the final analysis, the problem is simply as stated.

Close supervision is easy to talk about, but it is not easy to insure. If the enterprise is small, the employer may be able to give the supervision himself. If he is an exceptionally capable man, he may be able to minimize the driving attitude by inspiring loyalty or friendship in the men and by arousing their interest in the success of the business. As the enterprise becomes larger, however, supervision must be delegated, and this close personal contact is lost. The problem then is to select supervisors who will be capable of doing what the employer formerly did, that is, give intelligent, non-irritating supervision. The difficulty of finding supervisors capable of doing this is evidenced by the vast amount of literature on the subject of foremen and foremanship training and by the training courses which every large industry finds it necessary to maintain.

The securing of productive effort by an outside urge is at best difficult. When the incentive to produce is based solely upon a desire to retain the job by keeping in the good graces of the supervisor, the mental attitude of the worker towards his work and his employer cannot be considered to be good.

Incentives Put the Workman Into Business for Himself

When incentives are used, the supervisory problem is entirely changed. There is no longer any need to urge the man to produce, because the incentive furnishes a stimulus which originates within the worker himself. He gets paid for what he produces; therefore he produces as much as he can in order to earn maximum wages. Thus the mere setting up of an incentive system relieves the employer of one of his most pressing problems. He is sure of good effort from his workers, which means a fair return for money spent on wages and low and relatively constant labor costs.

Incentives tend to give the employer a fair return for his wage expenditures, the employee a fair reward for his labor, and the consumer a fair value for his money.

Hence, it would seem that every employer would be eager to introduce incentives in his plant. This is not always the case, however. Some employers distrust incentive systems and hesitate to install them, and in assuming this attitude, they have definite reasons. First, there must be a supervisor who establishes the incentives. This man must be familiar with shop practices, must understand the handling of men, and must be thoroughly informed upon and practiced in methods engineering work. A man with these qualifications, unfortunately, is not always easy to find.

There is also sometimes a feeling of distrust of incentives and a tendency to be satisfied with conditions as they are. The distrust is due to a realization of the difficulties which plants have experienced when incentives were not properly introduced, and the tendency to be satisfied with things as they are is the result of inertia. Progressive, far-sighted employers are not influenced by either of these factors. Instead, they recognize the many other benefits which incentives bring, not the least of which is the aid which they give to the line supervisors or foremen.

The duties of the foreman are changed by the introduction of incentives, and in many ways they are made easier. The foreman must see that material is on hand at all times, that machines are in repair, that complete instructions are furnished, and so on. He tries to do all this under the day work plan, of course, but since day workers are usually willing to accept any conditions which may exist, provided they are not physically harmful, they often do not call the attention of the foreman to breakdowns, poor conditions of machine repair, oversized material, and so on until circumstances force them to. Where incentives are in effect, the workers insist that all conditions must be right so that they can make maximum earnings. Thus the workers, by bringing to the attention of the foreman undesirable conditions as soon as they arise, aid the foreman to keep his department in shape for securing maximum production.

Turning the Spotlight on Plant Methods

The introduction of incentives turns the spotlight on methods and keeps it there. The methods engineer, of course, spends a good portion of his time working upon the improvement of operating methods. The men also become interested in making improvements, and devise new methods which they would never have bothered with under the day work plan. This, of course, makes for increasingly lower costs and higher production. Work is always done more systematically where incentives are in effect, and the foreman's duties tend to become more sharply defined, and hence are easier to handle.

In the last analysis, however, the greatest benefit to the foreman lies in the improved relations with his men. He is no longer the task master, continually upon the alert for idling, undue absences from the department, "private" jobs done on company time, and all manner of other work evasions. Instead, his position is one of cooperation with the men, and his work is for the purpose of aiding them to get out the maximum production which they both desire. The big boss and humble worker relationship disappears to be replaced with a friendly man-to-man attitude of working together towards a common end.

To summarize, the employer is definitely benefited by the incentive basis of wage payment. Unit costs

are reduced, manufacturing operations are better controlled, and supervision becomes easier. The change over is somewhat costly and may disrupt production to a larger or smaller extent if not properly handled. When supervised by a competent methods engineer, the change may be made smoothly, and the savings which are made quickly pay for the cost of the installation. In the end, profits increase.

The employee, on his part, views the matter of incentives from the standpoint of his pay envelope or his own personal profit. If earnings are greater under the incentive plan than they were under day work conditions, he will have reason to feel that he is being treated fairly, even though he has to produce considerably more than before, provided the effort required is not excessive.

Under day work conditions, the urge to produce is based largely upon a desire to hold the job, as has already been pointed out. Hence, after a rate of production has been attained which apparently satisfies the employer, there is little or no further incentive to increase production. At the same time, there is always the thought that the boss may be watching and possibly silently criticizing, and this encourages a busy "front" and an almost subservient attitude. The cartoons by Williams in his "Out Our Way" series depicting incidents in the machine shop portray this amusingly but accurately.

As opposed to this, there is also a tendency for the day worker to feel that he knows more about the details of his job than his boss, and this gives him a certain amount of pride in his work. He usually receives scanty instructions, and he must work out the details of the method he is to follow. If he is at all ingenuous, he develops certain short cuts a time saving practices, of which he rightfully proud.

Under incentive systems, t worker is no longer so subservient the foreman. He knows that he producing at his best rate, and th knowledge gives him an independen of spirit not as noticeable in d workers. He even sometimes has th chance of calling to the attention the foreman exhaustion of materi supply, improper tools, lack of suf cient instructions, or the like whic are caused by the failure of the for man to do his own job properly, an the worker would be less than huma if he did not enjoy a situation of thi kind.

On the other hand, where caref motion and time studies are made skill is not so much a function of th worker as it is of the managemen The worker therefore may lose som of his former pride in his own know edge of the work for he realizes tha others know as much or even mor about it than he does. If he furthe realizes that the methods engine has gained this knowledge in a fe days whereas it took him months even years, he is apt to feel somewh humiliated. Whether or not th feeling exists is largely a matter the approach used by the metho engineer. If the methods engineer tactful, considerate, and quick recognize and praise the good metho developed by the worker, and if h enlists the interest and the coopera tion of the worker in developing be ter methods, the worker will tak more pride in following the ne method than he did in using the ol

Time or money allowances, particu larly the former, give the worker mark to attain and surpass. A stand ard is set up, and the worker tri to beat it. An element of compet

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2. **Shows the unfinished hardened surface as it comes from the heat treatment.**
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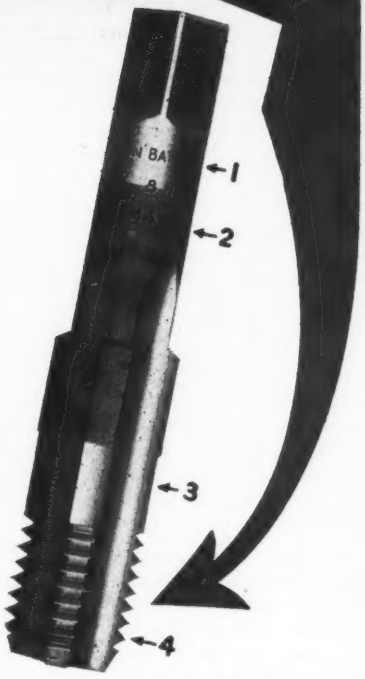

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tion is introduced which tends to make the work more interesting and more in the nature of a contest. Investigations have shown that boredom is to a large extent relieved by the introduction of incentives.

Inaccurate Time Values Destroy Confidence

Workers object most strenuously to incentives improperly applied. If time values are established inaccurately, or if the wrong basis is established for rewarding accomplishment, the workers will be dissatisfied. Inaccurate time values destroy the confidence of the worker in the knowledge and ability of the man who is establishing them. His effort is also retarded, for he dare not make too great a showing on jobs with high time values, realizing from experience that there is a tendency on the part of the employer to seek for reasons for reducing high time values, regardless of whether time values are guaranteed or not. If he has no confidence in the methods engineer, he feels that the value may be made as much too low as it was too high, and hence he acts in self protection.

If time values are established accurately, this condition does not exist. If the worker has confidence in the fairness and ability of the methods engineer, he will even point out an occasional time value which has been set too high through a clerical error. He knows that the methods engineer would increase a value set too low for the same reason, and hence his sense of fair play leads him to refuse to take advantage of mere clerical errors.

Sometimes time allowances are established on the wrong basis, so that output and effort are not proportional. The use of the weight of castings as a basis of payment is a familiar example of this kind. If th castings produced during one we are heavy and solid, the molders r ceive high wages. If the next week work is light and requires the settin of many cores, earnings fall off m terially, although the same or greater effort may have been e erted. Such conditions cause dissa isfaction on the part of the worker and destroy the incentive to produ If the wrong basis for payment used, the worker will be quick to di cover it, and whether he is able explain the error or not, he will kn that something is wrong and w complain.

If time values are accurate, co ditions good, the basis for payme correct, and the methods engineeri work intelligently introduced, t worker will like working under ince tives better than on the day wo basis. The most important matt to him is his pay envelope, and if is able to earn good money by exe ing a good effort, he will welcome t opportunity of doing so.

The consumer cares little about t details of wage payment plans, b desires to get the most he can f his money. Incentives, by reduci costs, tend to aid in this respect. would, of course, be entirely possib for the employer to pocket all of t savings brought about by the use incentive plans, but usually compe tion forces him to pass on at le part of the cost reduction to the co sumer. Lower costs mean th either the consumer is able to satis more wants, or that more consume can satisfy certain wants.

Employers Are Consumers

Lower costs mean greater volu of business. It must not be forgott that a large portion of consumers a also employers and employees. He

greater volume of business benefits em. Also, if incentives bring larger ofits to the employer and greater rnings to the worker, then as con-mers they are able to purchase still ore of the lower cost goods, and so . The circle of benefit continues til something goes wrong as in the st depression. When purchasing wer is interrupted, manufacturing curtailed, profits and wages are wer, purchasing power goes still wer, and so on.

There are a number of factors hich start depressions, but incentive stems of themselves are not among em. Perhaps they contribute indi-ctly, because certain employers e all savings for themselves, in-ead of reducing prices, stimulating mand, and thus providing work for e men who were displaced by the oduction of incentives. It is not prime cause, however, for no de-ession would be ended merely by cing all employers to go back to y work conditions. Employment ght be temporarily stimulated, as tput per worker was reduced. On e other hand, wages would be lower, ofits less and costs greater. Cer-inly no depression could be ended this way.

One of the great problems which es the employer, the employee, and e consumer or society as a whole how to use wisely the benefits hich incentives bring. If the em-oyee produces his utmost, he will oduce goods which his employer n sell at a profit if the latter can d enough consumers with money ho desire his product. Aside from e fact of the employee producing s utmost, there are too many "ifs" the preceding sentence, and under e existing economic set-up, it is ubtful whether all of the "ifs" can entirely eliminated.

Theoretically any improvement which is made should benefit the employer, the employee, and the consumer. Just how much benefit each should receive may be difficult to say, but certainly all savings should not be made at the expense of displaced labor.

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Although completely covering the subject, the text is written in an interesting manner and includes a number of photographs and descriptions of the different kinds of Reeves Variable Speed Control Units as applied to a wide range of industries.

This book should be in every mechanical engineer's library and a copy will be sent, without charge, to any mechanical engineer or plant executive who will address his request to the firm mentioned.

Reduce Your Material-Handling Costs

It has been estimated that the expense of handling materials represents, in some cases, as much as 90 per cent of the cost of a manufactured article.

This article tells how several firms are reducing handling costs.

By Douglas Wharton

Fig. 1—A simple, but efficient, method handling materials from the receiving dock the storeroom or machines.

INSOFAR as the greater part of all manufactured products is concerned, undoubtedly the largest single item in the cost of production is that of material handling. If all handling and transportation of materials between operations could be made automatic, the cost of the labor involved in the manufacture of those products would be reduced materially —in some cases to as little as 10 per cent of what it is today.

In certain industries, such as the automobile manufacturing industry, the above facts are recognized and a great deal has been done along these lines. Still, while it is too much to expect that all manual handling of materials can be eliminated, a wonderful opportunity is open for improvement of material-handling cilities and the reduction of non-p ductive labor costs in most plants.

There are two fundamental pri ples involved in all successful effo to reduce the cost of handling m terials. The first of these consi in eliminating all rehandling, as as possible and the second in creasing the size of the unit handl To illustrate the first principle, us cite the case of a manufactu of a well-known product in wh receiving department were unload bulk materials, steel sheets, box barrels, and crates of castings forgings, bundles, and other un Upon being unloaded from the

these materials were set on the platform, loaded from the platform onto two- or four-wheel trucks, moved into the receiving room, unloaded and left standing until checked into stock, then reloaded onto the trucks and moved into the store room to be unloaded and wrestled into the spaces alloted for them.

Eventually the material-handling equipment shown in Fig. 1 was installed and the material-receiving system was changed so that now, when the material is picked up from the unloading platform, it is transported direct to the proper location and deposited without any intermediate handling whatsoever. The net result is that the handling costs have been more than cut in half, the receiving room is in orderly condition, and no trouble is encountered in locating the complete supply of parts of materials of a given type or nature.

As an illustration of the second principle the writer has in mind the case of a wire manufacturer who, at various times, built several large additions to his plant and equipped these additions with adequate material-handling equipment such as that illustrated in Fig. 2. This manufacturer has been able to secure and maintain what ordinarily would be considered more than one manufacturer's share of the available business in his field, whereas other manufacturers have been unable to operate their mills in a manner that will enable them to compete profitably with the manufacturer first mentioned. This same condition may be found in paper mills, textile mills, foundries, machine shops, and other kinds of plants.

Incidentally, the illustration Fig. 2 shows a very unique installation of equipment. The unit shown here is known as a "hairpin hook" unit and is designed to carry a 3,000-pound load of wire or rod. The unit consists of two hoisting and traveling units, each equipped with two motors for driving purposes, and the twin hook suspension. The unit travels at a speed of 600 feet per minute, and the front end of the hook can be lowered or raised by control within the cab, making it possible to pick up a load of wire from the floor without assistance and then tip the front

Fig. 2—Wire-handling equipment in a steel mill. With the aid of the "hairpin hook", the operator can pick up coils of wire from the floor without assistance.

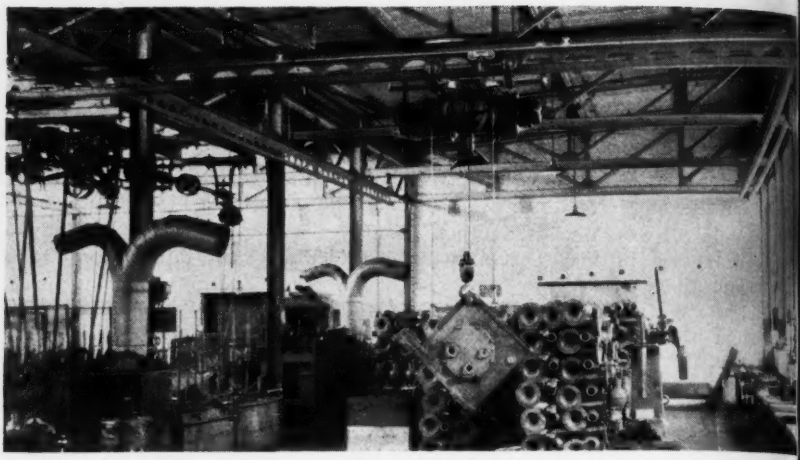

Fig. 3—Shepard Electric Hoist used with Cleveland Tramrail for handling dies.

end of the hook upward slightly so as to prevent the coils from sliding off the hook. All motions of the unit are controlled from the cab, and the whole system is protected in such a manner that it is impossible for the operator to run the carrier off the switch or through the open end of a rail.

The modern necessity for maximum production and minimum costs has fostered the development of some very ingenious devices for the handling of materials. The I-beam systems which served the purpose so well for many years are being found inadequate, in many instances, to meet the demand for more flexible, adaptable, and speedier methods of overhead conveying. In other words, the necessity for lower manufacturing costs is forcing a change from freight methods to express methods of transportation within the plant.

To meet this change in conditions, several manufacturers of conveying equipment have developed special rolled sections of various sizes and shapes for which carrier wheels and trolleys have been designed. Among these is the Cleveland Tramrail Division of the Cleveland Crane & Engineering Company, which, some fifteen years ago, developed a highly specialized rail of high manganese and carbon content with a raised section or wearing tread over which the carrier wheels operate at a speed of as high as 600 feet a minute without any sign of wear on the part of the rail.

The change from the home-made I-beam systems with their plain trolleys to present highly-developed, specialized monorail or Tramrail systems has been very rapid in recent years. Trolleys with common bearings, operated by hand, have been discarded for trolleys or carriers with roller and ball bearings in both the hand and electrically-operated types. These changes have involved not only the travel motion of the carrier, but also the transition from hoists of the chain type to the highly-developed electric hoist of the present day.

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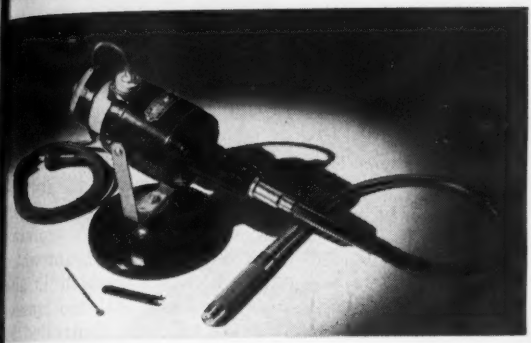

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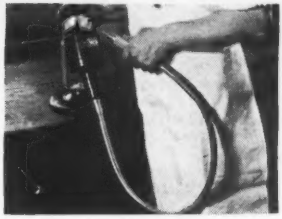

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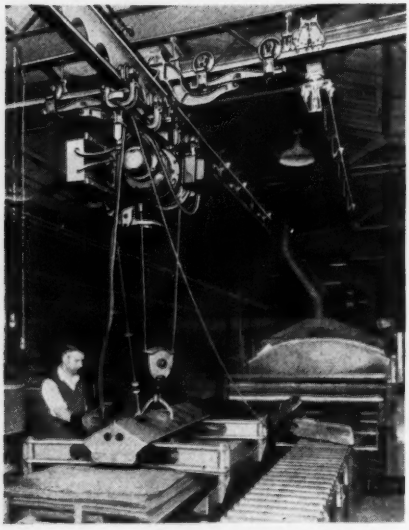


Fig. 4—Electric hoist used with power-operated "grab" for handling sheet metal.

the hand-pushed type and the electrically-propelled type, and for both floor and cab control by the use of ropes or push buttons in the case of the floor-controlled systems and drum-type controllers in the case of caps or platform - controlled equipment. Most of these several types of carriers can be arranged for variable and single speed control of both the hoist and travel motion.

An example of the manner in which an electric hoist is adapted to a carrier of the hand-pushed type is shown in Fig. 3, where a Shepard Electric Hoist is illustrated in conjunction with a Cleveland Tramrail carrier. This equipment serves the purpose very well where the task consists mainly of handling materials for short distances, as in the case of handling dies from a truck to the bench.

The equipment illustrated in Fig. 4 is used in a large plant in Springfield, Mass., for handling sheet metal. This unit consists of a tramrail carrying an electric hoist from which is suspended a "grab" which is also electrically-operated. All motions of the hoist and grab are controlled by the operator from the push button which is in his hand, the contactor panels and other accessory equipment being mounted on the carrier unit.

The arms on the grab are actuated by a motor-operated screw which moves them in or out as required to pick up or release a load of sheet steel. A reversing motor is used, the direction of the movement of the motor, and thus the arms, being controlled by two push buttons. The grab is also sometimes used in con-

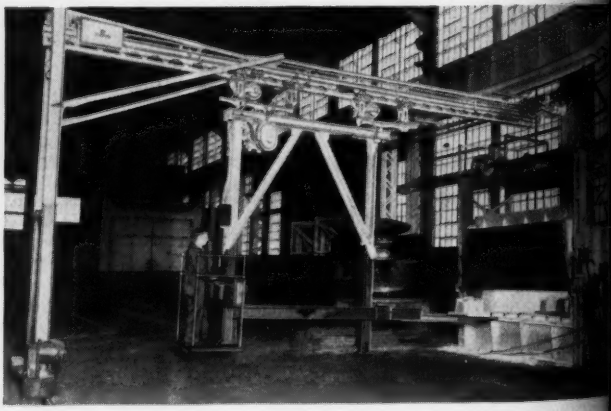
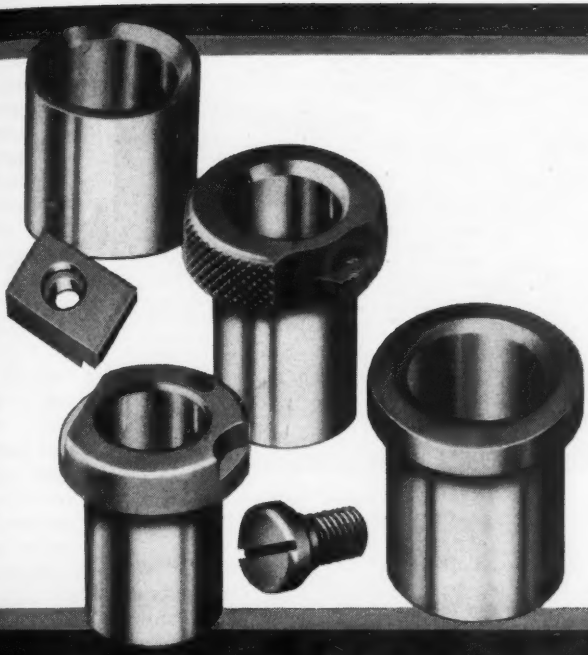


Fig. 5—Cleveland motor-operated single-leg gantry crane, used to han carburizing pots into and out of the furnaces.



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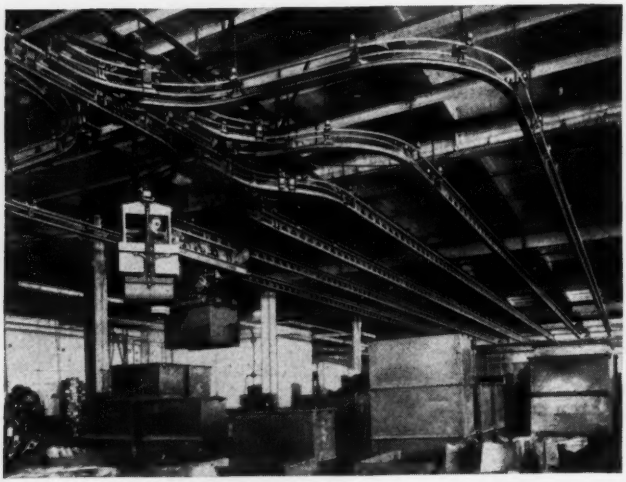

Fig. 6—View in the storeroom of a washing machine manufacturer, showing tramrails and carrier for moving parts.

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Figure 6 sho
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nection with a cab and grabs of various designs are used for handling rolls of paper, textiles, and so on.

A large plant in East Pittsburgh uses the equipment shown in Fig. 5 for handling carburizing pots into and out of the furnaces. The Cleveland Crane & Engineering Co., who built the unit, call it a motor-operated single-leg gantry crane. The leg rides on a floor rail, while the rear end of the unit is suspended from an overhead rail at the rear of the line of furnaces, each end of the unit being equipped with a travel motor.

The cab and lift are suspended from the bridge of the crane, upon which the cab unit travels back and forth by power supplied by the two motors above the lift just under the bridge. The platform end of the lift can be raised or lowered as required to place the pots in the desired position in the furnaces, power for which is supplied by the motor shown suspended in the triangle just above the operator's hand. All motions of the plant, wherever there is ne
for transporting parts and materi
back and forth. In the storero
the containers are placed in ro

(*Continued on page 40*)

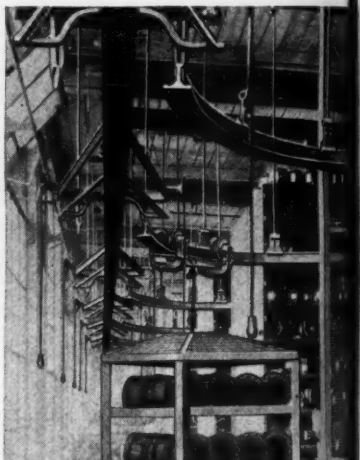

Fig. 7—Another method of using the tra
system in a storeroom.

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WEST ALLIS WISCONSIN

The Design of Temporary Dies for "Small-Lot" Stamping Jobs

Interest in temporary dies and their design has been revive during the past couple of years. The author of this article tells how temporary dies are made.

By Charles Kugler

THE methods employed to produce workable and accurate dies at a cost low enough so that a comparatively few stampings can be made profitably have received a con-

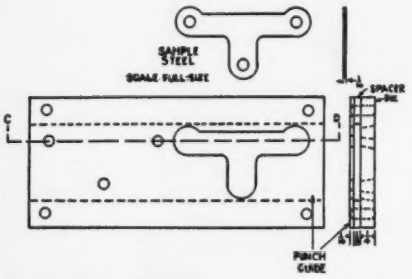

Fig. 1—Steel stamping made with temporary dies.

siderable amount of attention during the past several years. To a large part of the industry the idea is quite new, but to the old-timers in the die and stamping business, temporary dies are an old story.

The drawing Fig. 1 shows the general design of a part for a steel range that was the pride of the kitchen thirty years ago. These parts were made with what we now call "temporary" dies, which were built by the writer. The advanta of this type of die is, of course, i low cost, which is practically nev more than 20 per cent of the co of the usual type of permanent di with guide posts. However, such die will do just as good work as th more expensive dies in cases whe not more than 10,000 blanks are t be made.

The handling time in connecti with the operation of a temporar die is large compared with th amount of time required for the u ual die. A temporary die can b used in practically any type of pre that is used for stamping metal, bu the die is never bolted down unle the hole in the bolster is larg enough for the stamping to dro through.

The first point to be noted by th prospective designer, maker, or use of a temporary die is that nothing i attached to the ram other than a hardened flat plate which serves a a "pusher" for the punches, indi cated at A in the drawing. Th movable parts include the die punches, punch guide, and spacer Holes are provided in the punch guide for the shanks of the sever

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punches, these holes being properly located so that the punches will, of necessity, punch the material at exactly the right locations.

Since the die is very thin, it must be well supported and if the hole in the bolster is too large to provide the necessary support, as is often the case, such support is obtained by using a solid plate under the die as indicated at **B**. The spacers are placed between the punch guide and the die, at the edges, to hold the guide at a height which will provide clearance for the stock between the guide and the die.

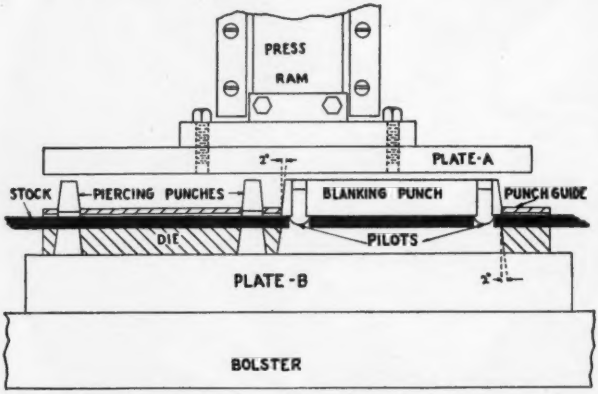


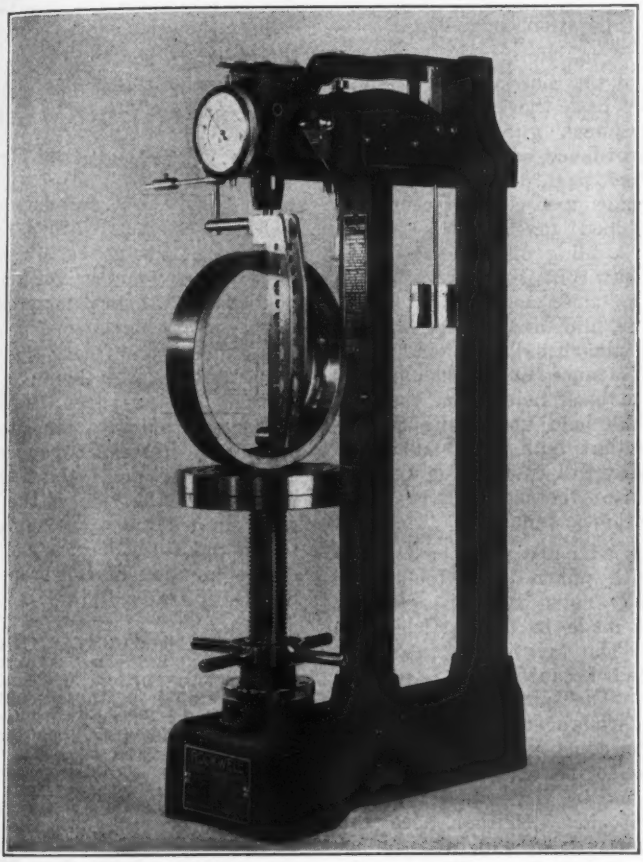
Fig. 2—Drawing illustrating method of using a temporary die.

Strip stock is fed through the die in the usual manner. With the die and punch guide in position and material and the punches in their respective holes in the guide, the press is operated. As soon as the punches have been driven through the stock into the die, the movable parts—die, guide, punches, and blanks—are pulled out from under the press ram, the punches and parts dropping into whatever receptable is provided for them. The die is then replaced in the machine, the stock is fed into the die, the punches are set in position in the guide, and the operati is repeated.

If the machine affords sufficie support for the die, it may clamped in place on the bolster a need not be removed until the is completed. The material fr which the punch guide is made sho be approximately 1/16 inch thi The thickness of the die will depe upon the thickness and hardness the stock, but should be made thin as possible save both mater and machining ti However, I h never used mater less than 1/8 i thick for the plate, regardless the thinness of stock, although have used ¼-i material to mak die plate for m ing stampings fr 1/8-inch steel st

The punches, spacers, and pu guide can be made from cold r steel, if the run is not too l and the stock is not too hard. punches and die should, of cou be carburized and hardened. H ever, the punches and die will much longer if they are made fr tool steel.

The length of the punches sho be no greater than is necessary, the punches must be longer than combined thickness of the die, p cer, and punch guide, so as to sure that the blanks will be cer clear of the die. Each punch sho be made straight for about 1/8 i from the cutting end and then pered from this point toward rear end at an angle of abou degrees, as shown in the illustra



We were given the problem of building a "ROCKWELL" Superficial Hardness Tester to test the inner cylindrical surfaces of ring gauges and to make only a very minute indentation.

Here is the machine we built, which, for the purpose of illustration, is shown testing the inner surface of a large ball race. Hardness must be measured and never guessed.

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This is done so that the punches will easily drop through the die after the blanking operation has been completed.

To make the die and punch guide, the writer uses the following method: The punch guide is first laid out in accordance with the design of the finished part, then the die and punch guide are clamped together and machined together as far as possible. A filing machine should be used to saw out the core of each opening as close as possible to the layout line, finishing to the line by filing in the usual manner. A 2-degree clearance angle should now be filed in each hole, from the bottom of the hole up to the cutting edge, so that both the blanks and the punches will easily drop through the die after the blanking or piercing operation is finished.

Readers who are more or less familiar with punch press tools have undoubtedly noted that no reference has been made in this article to a stripper. The fact is that no stripper is used, because there is nothing to strip. The punches pass completely through the die and the work, consequently the work does not have to be stripped from the punches as in the usual types of permanent dies. Neither does this type of die require a die shoe, punch pad, or punch holder. The punches must, however, be a snug fit in the punch guide, and the usual amount of clearance must be allowed between the punch and the die.

The plate A can be attached to the bottom of the ram with heavy screws, or it can be provided with a shank that screws into a threaded hole in the plate and fits into the press ram in the same manner as a punch holder. The plate should be hardened, because it bears against the tops of the hardened punche and, if left soft, will soon be full indentations made by the upper en of the punches.

Reduce Your Material-Handling Costs

(*Continued from page 34*)

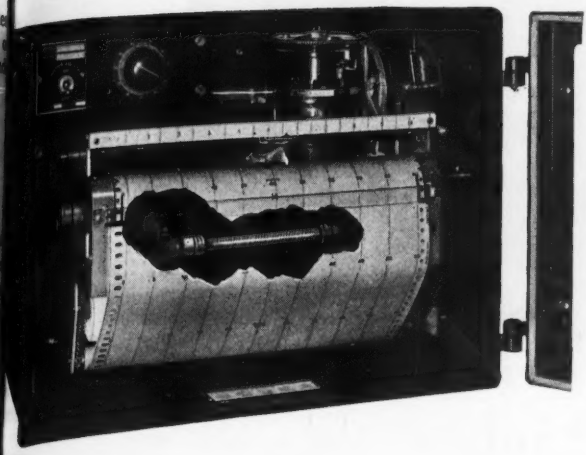
with space between the rows f aisles, a tramrail being suspend over each row of containers. Th it is an easy matter for the carr to pick up the raw materials, mo them to the machine shop or oth department, and bring the finishe parts into the storeroom for storag in their alloted space.

Figure 7 shows a variation of t stockroom tramrail arrangement. I this instance the main tramrail e tends along the side of the buildin with branch rails extending off b tween the rows of bins and switch at the junction of the branches wi the main tramrail line.

BALDWIN - DUCKWORTH CATALO K-1: The Baldwin-Duckworth Cha Corporation, Springfield, Mass., has i sued Catalog K-1 on Chains an Sprockets for Power Transmission, Co veying and Elevating. The catalog co tains 54 pages and is pocket size.

It describes and lists the company standard roller chains, parts and a tachments, multiple roller chains, e tended pin chains, non-corrosive chain block chains, cable or leaf chains, sp cial purpose chains, steel replacemen chains, sprockets for roller chains, e In all cases full technical informatio is given.

A special feature of this pocket catal is a 20-page section devoted to practic engineering data of distinct value t chain users. It contains rules and fo mulas for determining chain size, lengt pitch, sprocket diameter and ratios, rul for installation, alignment and oper tion, lubrication methods, etc. Of sp cial value are a series of horsepow charts and tables for determining th right chain to use, knowing the hors power to be transmitted, the revolution per minute and the number of teeth i the smaller sprocket.



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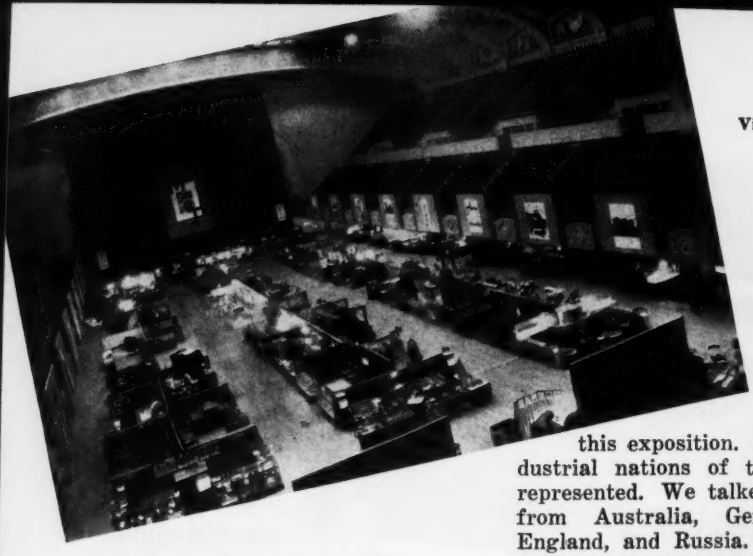


View of the Arena Section.

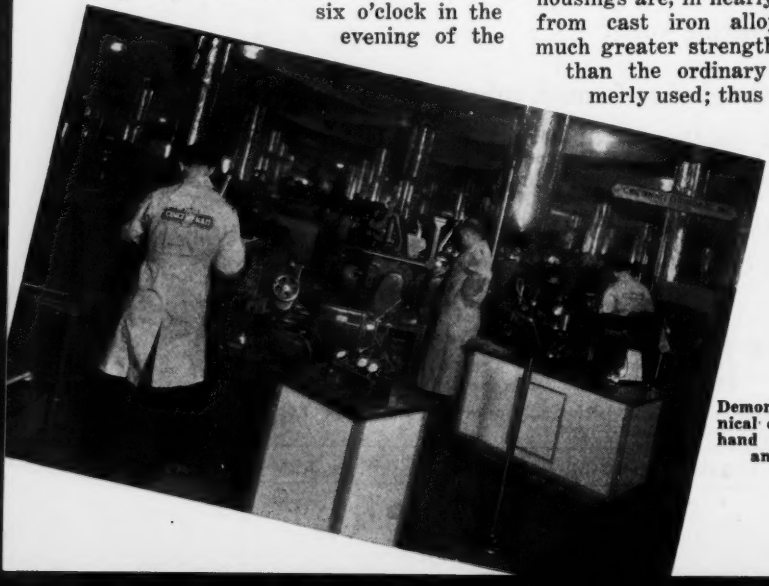
High-Lights of the Machine Tool Show

IT was a great show. From nine o'clock on the morning of the opening day until the "whistle blew" at six o'clock in the evening of the closing d... the Exposit... Hall w... crowded wi... visitors, sc... of whom h... come 12,0... miles to s... this exposition. Most of the i... dustrial nations of the world we... represented. We talked with visito... from Australia, Germany, Jap... England, and Russia. Germany se... 35 mechanical experts in one gro...

As compared with the equipme... displayed at the 1929 Machine T... Show, the machines comprising t... year's display were of heavier desi... built to produce within closer li... of accuracy, easier to operate, ... signed along more pleasing lines, ... better finished in general.

In the vast majority of cases ... vision has been made for more po... in order to meet the demands cre... by the new cutting alloys. Beds ... housings are, in nearly all cases, m... from cast iron alloys which h... much greater strength and toughn... than the ordinary cast iron f... merly used; thus they are ena... to withst... vibration.

The i... creases ... speeds ... feeds was ... ticularly ... ticeable.

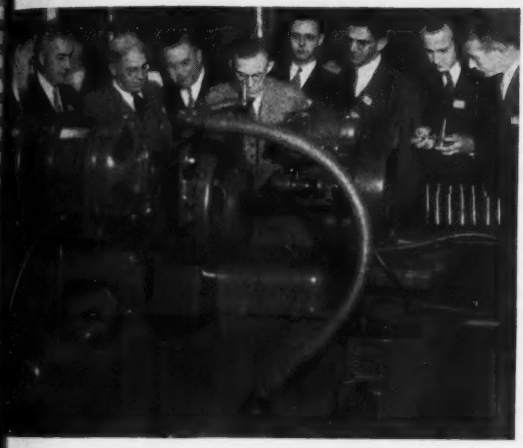


Demonstrators and t... nical experts w... hand in every bo... answer questions

One of the heavy machinery exhibits.

ide tools and utters are responsible for his.

Noticeable roughout the ntire show as the wide e of hydraulic mechanisms for eeds, indexing, clamping, and for

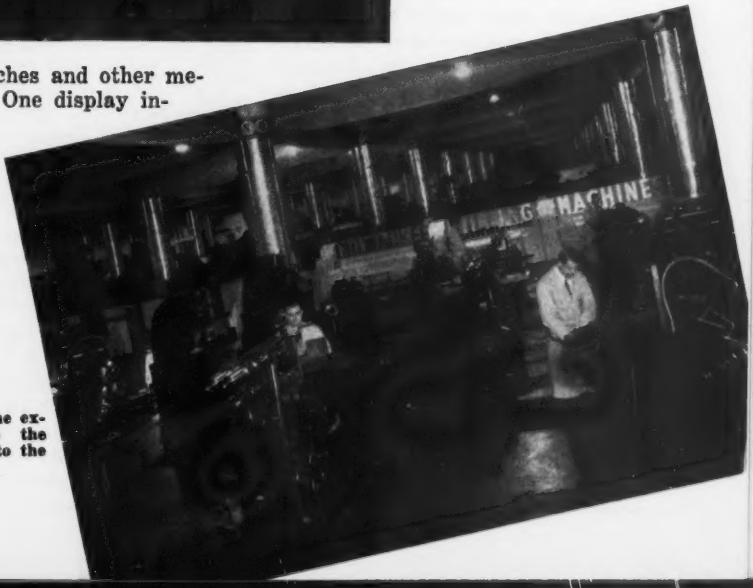


ntrolling clutches and other mechanical units. One display included a machine with a ydraulically-ontrolled indle.

Among the achines exbited by a lathe manufacturer was one with a variable speed "Transitorq"

A characteristic scene; a group of manufacturing executives and engineers watching the demonstration of a modern grinder.

built into the head, both to drive the spindle and to provide an



iew of one of the exbits just before the rs were opened to the public.

Looking east from Booth No. 813 in the New North Annex.

infinite range of speeds up to the full capacity of the motor. Another exhibit included a turret lathe driven by a four-speed motor, the armature for which was built integral with the machine spindle. Still another turret lathe, also built with a four-speed motor, provided hydraulic control both of the feeds and of the clutches.

An interesting unit consisted of a small high speed lathe with an ammeter built into the head of the machine in such manner that the operator can at all times see the dial and thus note the amount of power required to operate the machine. Increases in the amount of current consumed indicate a dulling tool. When the amount of power required is double the amount required with a fresh tool, the tool is removed and sharpened. The same device is used on a broaching machine made by another manufacturer.

Much interest was being created by a lathe with a slide rule built into the headstock in such manner that the lathe makes its own calculations and shows the cutting speeds in surface feet per minute for each setting of the speed levers.

The almost universal use of au matic lubrication indicates the i portance with which this feature machine tool design is regarde Automatic lubrication is necessa not only because of the heavier servi to which the machines are subjecte but also as a time-saver and as protection against loss of the inve ment in the tool.

The old question as to whether not a planer can cut when the bed traveling in either direction has fina been answered. One of the exhibito displayed a planer with a double to which cuts with the bed travelin either way.

Of particular note was the amou of chromium plating that is bei used on feed and lead screws to pr vent wear. Chromium plating is al being used on the spindles of jigborin machines for the same purpose.

And—last but not least—manufa turers who visited the show indicat their faith in the future of Americ industry by placing orders at t show for approximately $5,000,0 worth of new equipment.

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Use of Colloidal Graphite in Cutting Fluids

Abstract of A. S. M. E. Cutting Fluid Subcommittee Progress Report No. 6 "The Influence of Cutting Fluids on Tool Life in Turning Steel". Semi-Annual Meeting of A.S.M.E., Cincinnati, Ohio, June 17—21, 1935.

By Professor O. W. Boston, Assistant Professor W. W. Gilbert and Assistant Professor C. E. Kraus

A NUMBER of tests have been run on S. A. E. 3140 steel in a normalized and annealed condition in the form of a 14-in. diameter and 48-in. long forging having an average Brinell hardness of 190. The chemical analysis of the forging in per cent was as follows: 0.42 C, 0.69 Mn, 0.021 S, 0.017 P, 0.17 Si, 1.41 Ni, and 0.61 Cr. A 30-in. lathe was used in these tests. Tool bits 3/8-in. square of 18-4-1 high speed steel were used. The tools were ground to standard shape. The size of all cuts was 0.0125 in. feed per revolution and 0.100 in. deep.

Colloidal graphite in cutting fluids for turning steel were investigated as an addition to (a) an aqueous solution (b) a soluble oil and (c) a plain mineral oil. Comparative tests were also run using as the cutting fluid (a) distilled water, (b) distilled water plus 1½ per cent of borax by weight, (c) three proprietary brands of soluble oil, (d) plain mineral oil having a viscosity of 110 Saybolt seconds at 100 degrees F.,* (e) mineral oil plus 5 per cent oleic acid, (f) surphurized mineral oil (4 per cent sulphur) having a viscosity of 110 Saybolt seconds at 100 degrees F., and (g) a sulpho-chlorinated mineral oil. The cutting fluid was applied to the tool at the rate of 4.5 gallons per minute. The steel cut was an S.A.E. 3140 in a normalized and annealed condition.

This investigation studied the relation of the cutting fluid on tool life and cutting speed in turning steel. The tool life is expressed in minutes from the time of starting the cut until the tool failed, as indicated by the sudden breaking down of the cutting edge.

Preliminary tests showed that oils are beneficial for thin deep cuts; that the most promising carrier for using colloidal graphite was oil; and that the optimum amount of colloidal graphite to use in a plain mineral oil was 0.153 per cent by weight.

The results of the tests show that the plain mineral oil, which by itself is the poorest cutting fluid, becomes by the addition of colloidal graphite the most efficient cutting fluid, surpassing the popular sulphurized mineral and sulpho-chlorinated mineral oils. The finish produced with the mineral oil containing colloidal graphite was superior to that obtained with the other fluids under test. The increase in tool life obtained by the optimum amount of colloidal graphite

* *Subsequent tests in production have indicated the desirability of using a neutral mineral oil of approximately 200 seconds viscosity at 100 degrees F.*

who said so?

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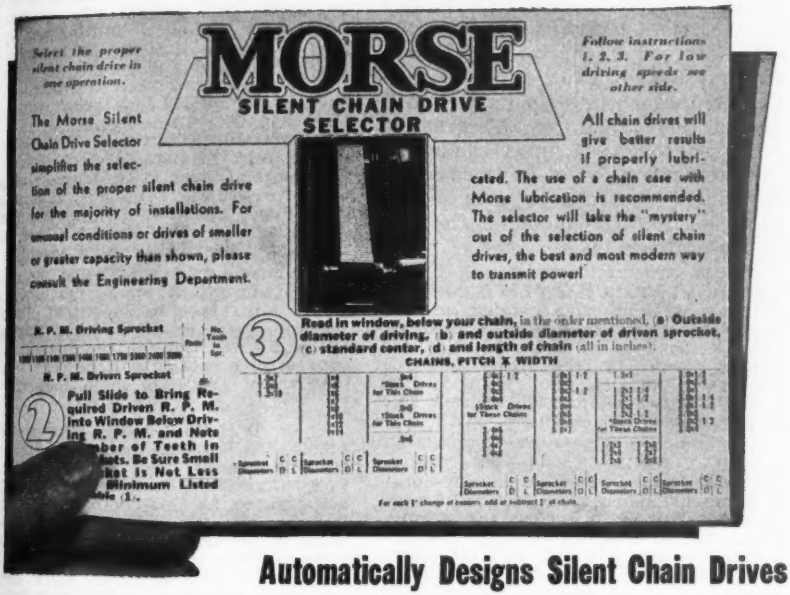
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R. P. M. Driven Sprocket
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Pull Slide to Bring Required Driven R. P. M. into Window Below Driving R. P. M. and Note Number of Teeth in Sprockets. Be Sure Small Sprocket Is Not Less Than Minimum Listed Above (1).
3
Read in window, below your chain, in the order mentioned, (a) Outside diameter of driving, (b) and outside diameter of driven sprocket, (c) standard center, d and length of chain (all in inches).
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DIVISION OF BORG-WARNER CORPORATION

in oil averaged 400 to 600 per cent, whereas, the increase in allowable cutting speed using the optimum colloidal graphite in oil was about two-fold.

The report gives a graphical summary in which the highest tool-life curve is obtained with the light mineral oil containing 0.153 per cent colloidal graphite by weight and which curve is consistently higher than the curve for the sulphurized oils. Real economy is shown to lie in the selection of that cutting fluid which will do the job producing the greatest production; cutting fluids cannot be selected on a basis of cost; each job should be solved on its own merits and a record of production is the best means to those ends.

ACME PUMPS CATALOG No. 140: This twenty-four page catalog, printed in colors, gives complete information and specifications of Acme "Sure Flow" Pumps, made by the Acme Machine Products Company, Inc., Muncie, Ind. A copy of this catalog will be sent free to any mechanical executive.

SCULLY-JONES No. 105 CATALOG. This publication, issued by Scully-Jones & Company, 1901 South Rockwell Street, Chicago, Illinois, presents the Scully-Jones line of drilling, tapping, counterboring, reaming and milling tools, and a complete line of boiler tools. A considerable part of the text has been devoted to explaining the merits and uses of these tools, also a number of new developments in the tool industry. Line drawings showing sectional views of the tools and complete engineering data showing sizes and tolerances are included in the catalog.

A copy of the catalog will be sent free to any mechanical executive or engineer.

INGERSOLL CUTTERS. This book contains 48 pages of descriptions and illustrations of the Zee Lock Milling Cutters, Zee Lock End Mills, Interlocking Cutters, Side Milling Cutters, Cemented Carbide Cutters, Multi-Blade Cutters, Adjustable Core Drills, Adjustable Reamers, Adjustable Counterbores, Special and Combination Tools, and other types and kinds of cutters made by the Ingersoll Milling Machine Company, Rockford, Ill.

Photographs and descriptions of a variety of jigs and fixtures made by this firm are included, together with data and illustrations of the Ingersoll Cutter Grinder.

A copy of the book is available to any mechanical engineer or plant executive upon request.

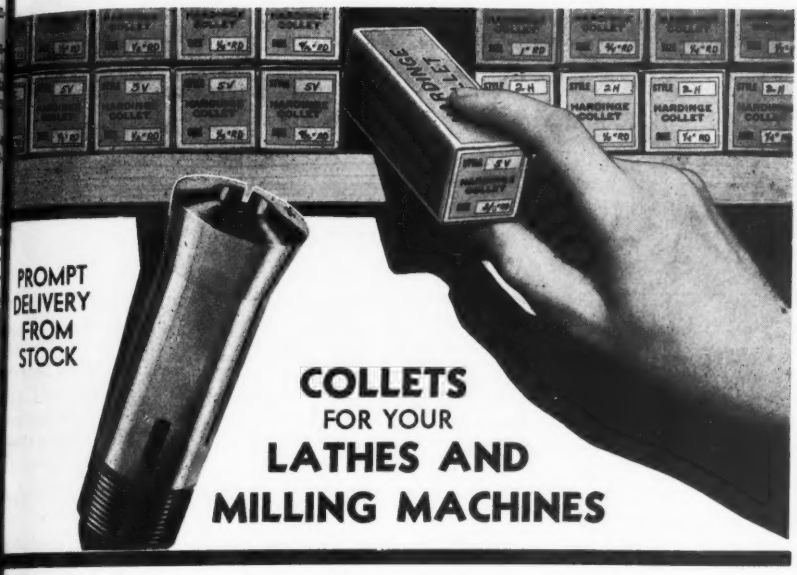
"A.M." SENSITIVE DRILLING AND TAPPING MACHINES. The complete line of A.M. Sensitive Drilling and Tapping Machines built by Adolph Muehlmatt, Fifth and Elm Streets, Cincinnati, Ohio, is described and illustrated in a new catalog which has been issued by this firm. This line includes the A.M. Maximus Super Sensitive Drilling Machines, A.M. Maxi-Jr.-E. Super Sensitive Drilling Machines, A.M. Maxi-Jr. Super Sensitive Drilling Machines, A.M. Maxi-Gem Super Sensitive Drilling Machines, A.M. Sensitive Drilling Machines, and the A.M. Sensitive Tapping Machines.

The book contains tables of the motor and spindle speeds for all machines, together with specifications and illustrations. A cross section drawing shows the entire construction of the machine. A copy of this catalog will be sent to any mechanical executive upon request.

V & O INCLINABLE PRESS BULLETIN. A bulletin describing the Inclinable Presses made by The V & O Press Company, Hudson, New York, is being issued by this company. In addition to the illustrations and descriptions of the important construction features of these presses, the book includes replacement charts which show clearly any and all parts pertaining to the standard machine. The specification sheets are so arranged that the reader can easily find the dimension of any particular item in which he may be interested.

Pages 14 and 15 present a complete set of line drawings from the No. 0 to the No. 6½, proportionally arranged, giving all the dimensions necessary for designing dies. These drawings and dimensions eliminate the possibility of errors and thus save considerable time over systems previously used. The pages following the line drawings show photographs of each of the various sizes of presses, making it possible for the reader to obtain a definite idea of the machine in which he is interested in relation to the other sizes.

A copy of the bulletin is available to any mechanical executive upon request.



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Federal Housing as an Aid to the Plant Owner

By Robert B. Smith
Federal Housing Administration, Washington, D. C.

SHORTLY after the armistice was signed and the United States was definitely out of the war, the one-time general manager of a large metal-working plant in New England gave up his $1-a-year job with the Government and hurried home. He had a definite idea in mind. The plant he previously had operated (and in which he had a considerable interest) had been producing war munitions, for which a large part of the plant equipment had been converted. Now the wheels had stopped turning and the plant was silent.

If you need new equipment for your plant, the government will help you finance the purchase. Here is how it is done.

While the one-time manager had been sitting at a desk in Washington, others, back home, had been operating the plant. The only problem had been that of production. Now the picture had changed practically over night and the paramount problem had again become one of marketing.

Our general manager arrived in town on the sleeper at 8 A. M. and at 9 o'clock his associates were gathered in his office.

"The war's over," he said, "and it's up to us to get back into harness as quickly as possible. We've been in business a number of years and we've got a good name. There's busine ahead—plenty of it—as soon as pe ple get their breath.

"They wanted our plant to turn o war materials, and we did and we glad to do it. But that's over no and we've got to get back into shap To do so we've g to do a number things.

"The equipme we have must eith be converted back its original purpo or be scrapped a new equipment p in its place. That for us to decide, a today.

"I've been doing lot of thinking Washington, and I've talked with lot of machinery men. I'm for scra ping almost everything and installi new. We'll save money in the e This is the day of modernization."

So it was agreed. Telegrams we sent inviting machinery experts come to the plant. Together w those who understood the plant's pr duction problems they designed ne equipment. Orders were signe When the changes were complet the plant was thoroughly modern.

The prosperity of the concern question is commonly recogniz Even in the worst years of the pression it operated at a sizea

profit, credit for which can be given to the modern machines and equipment. It was able to manufacture its product at costs considerably lower than similar products could be made by competing plants, and thus was enabled to operate while some other plants stood idle.

This modernization occurred, of course, 16 years ago. Some of the equipment installed at the time still remains, but new ideas are constantly being developed and new machines perfected. Within the year an extraordinary machine was added at a cost of $30,000, but the machine is capable of performing a number of operations, which previously had required the use of several machines.

Not all metal-working concerns are in financial position to take advantage of—like the one in New England—of the improved equipment of the day. Recent years have been lean, and manufacturing plants that have been able to operate on anything approximating a regular schedule have been fortunate indeed. Nevertheless, the necessity for modernization exists.

To enable the owners of plants to install new equipment and make structural changes of sizeable proportions and pay the cost over a relatively long period, Congress recently amended the insurance provisions of the Modernization Credit Plan established by the National Housing Act. The Act previously had limited insured modernization credit extended by private financial institutions to $2,000 for each property and restricted its use to repair and improvement of real estate. The amendment broadened the measure in that it increased the amount of credit which could be extended under certain circumstances and permitted its use for the purchase of essential equipment under certain conditions. It also extended the expiration date of these provisions of the Act until April 1, 1936.

Uncle Sam will help the American Manufacturer to finance the purchase of new equipment.

Manufacturing or industrial plants are able, now, to negotiate with private financial institutions for insured credit up to but not exceeding $50,000 for each property for specific improvements. It may be used for repair and modernization of buildings, including structural changes, and for

the purchase of certain equipment peculiarly adapted to the business for which it is intended.

The Federal Housing Administration, which administers the National Housing Act, lends no government money. What it does is to make it easier for the plant owner, or other individual, partnership or corporation, to obtain funds, through insurance of commercial banks, building and loan associations and other financial institutions against loss up to 20 per cent of the total of credit advanced for the purposes specified.

Credit may therefore be obtained from any of the 13,000 private financial institutions holding Federal Housing Administration contracts of insurance. Applications and credit statements are made on forms supplied by them. These forms set forth varied information intended to show the character and financial position of the borrower, his reputation for paying his bills and his capacity to repay the amount advanced in equal monthly installments over a period which may be as long as five years.

The cost of the credit depends upon the bargaining ability of the plant owner. The rate charged for it may be whatever the lending institution agrees to, provided that the maximum fixed by the Federal Housing Administration is not exceeded. This maximum charge is $5 discount per $100 original face amount of a one-year note to be paid in equal monthly installments.

The life of the obligation is also to be agreed on between the plant owner and the financial institution, but a maximum period of five years must not be exceeded. The plant owner will know how much he can pay conveniently each month and the financial institution, naturally, will give advice.

Where the amount of the credit is $2,000 or less, the applicant ne only convince the lending agency his capacity and willingness to m his obligations. A mortgage or ot security is not required. Where t credit is in excess of $2,000 custom business principles apply. The fina cial institution will want to inqui into the desirability of the improv ments to a greater extent and wheth the loan will be sound. If it sees to do so, it may require a chat mortgage or other form of security.

So far as repair and improveme of the real estate is concerned, the e penditures may be made in whatev way the plant owner sees fit. He m do the work by contract or he m purchase the necessary materials a have it done by the men already his employ. All sorts of repairs m be made.

So far as equipment is concerne some very definite regulations appl To be eligible for purchase it must peculiarly adapted to the busine conducted on the property or nece sary to its operation. It is not ne essary that the equipment be attach permanently to the property, but must be of a type which ordinari would not be carried or carted awa What is intended is that the m chinery be of the heavy and relative expensive type, capable of bei classed as durable goods.

The advantage of purchasing equi ment under this plan is that t terms are more liberal than those u ually available. As is common known, equipment manufacturers re quire a down payment in virtual every sale. Under this plan a dow payment is not required. The man facturer's limit of time usually do not exceed 18 months; under the Fe eral Housing Administration's pla the time, as has been said before, m be as long as five years.

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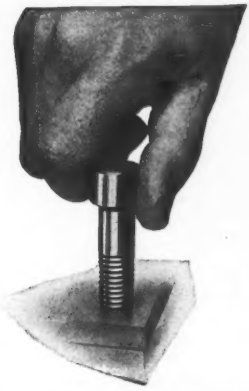

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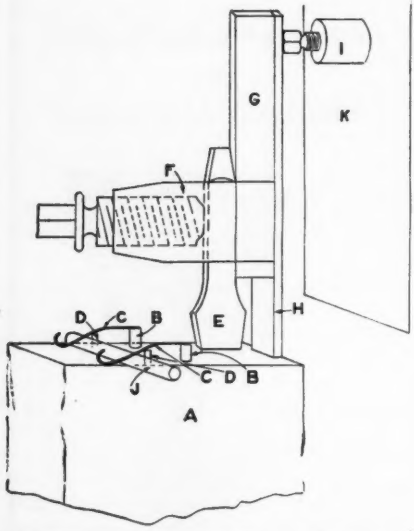
Rolling Letters On Cylindrical Parts

By Jos. R. Cowles

IT IS a simple matter to stamp letters or figures into flat work, using a hammer and hand stamp, but when the parts are of cylindrical shape, the job is not so easy. Having a number of cylindrical pieces into which a name was to be stamped, we developed a method which made the task simple, easy, and fast. The equipment used is illustrated in the drawing herewith.



Drawing illustrating method of setting up a shaper to stamp cylindrical work mechanically.

The operation was performed wi the aid of a shaper, the block A h ing held in the machine vise. Th block has been finished all over so to provide square working surface In the upper surface of the block w driven the two $\frac{3}{16}$-in. steel pins located about 1 in. apart and ea being left to project $\frac{5}{16}$-in. To t upper end of each pin was riveted steel spring, indicated as C in t drawing. Each spring was $\frac{3}{16}$-in. w and curved as shown.

In line with the pins B but approx mately $\frac{5}{8}$-in. ahead of them were cated the $\frac{1}{8}$-in. pins D, each of wh projected $\frac{3}{16}$-in. These springs pins served to locate and hold work-piece J. The steel hand stam indicated as E in the drawing, w clamped in the toolpost F of shaper with a piece of $\frac{5}{8}$-in. squ key stock and a piece of $\frac{1}{8}$-in. st steel H clamped behind it. The pie H is clamped so that the lower e just clears the block A when t stamp is set at the proper heig I is a small jack.

To operate, the piece to be mark is placed under the springs C a against the pins D to square it The stamp E is set to the prop height so that it will make an impr sion of the correct depth in the wo as it passes over it, and the piece is set so that it will just clear t block A. As the shaper ram mov forward, the stamp E passes over work-piece J, rolling it and stamp the letters into the work as it ro After the stamp has passed over

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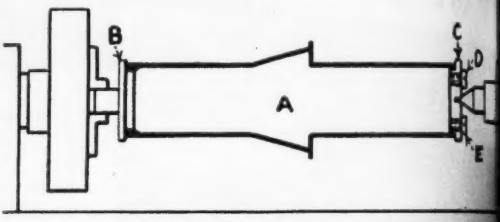
work, the bar H follows and ejects the work-piece into a box or pan provided for the purpose. Upon the return of the ram, another piece is placed in position under the springs and the operation is repeated.

The speed with which the pieces can be marked is limited only by the speed with which the operator can place the pieces under the springs. The machine speed can be regulated by regulating the length of the stroke. A special marking machine could have done no better work than was obtained with the aid of the shaper, using the equipment as described above, and the cost of the equipment was small indeed.

correspond to the shape of the m drel. In the case of a tube, this m that it should also be round. N with thin-walled, drawn tubes thi hardly ever the case. A somew oval-shaped tube would press clos all around the mandrel, and after machining operations had been co pleted and the part removed from mandrel, it will again assume



Drawing illustrating method of turning thin-walled cyl without chatter.

Machining Hollow Parts Without Chatter

By Rene W. P. Leonhardt
Berlin, Germany.

DURING turning operations on hollow parts, having thin walls and large diameters, such as parallel and straight tubes, the vibration set up in the wall of the piece often tends to cause chatter marks and render it extremely difficult, if not entirely impossible, to obtain clean and smooth surfaces and to maintain accurately the dimensions called for.

Usually such work is placed on snugly-fitting mandrels that offer a firm support for the whole inner surface. Naturally, this does not apply to parts having their diameters larger in the center than at the ends, as in the case of barrel-shaped tubes. Besides, when using a mandrel with a hollow part, it must be stipulated that the inner surface should exactly

former shape. Thus its outer surfa just machined, would again be ova

However, a thin-walled tube h ing rough and inaccurate inner s faces can still be machined extern with a high degree of precision i is first filled with a liquid having low a temperature coefficient as p sible and the least elasticity, as f instance water or oil, and if heat is carefully avoided during machin operations.

In the illustration, the open ends part A are closed without stresses the covers B and C. While attachi the covers by cementing or solderi the parts should be subject to no d tortion whatever. One of the cove is provided with an intake D for t liquid, and an air escape E. Wh filling the part with liquid, whi preferably should be of the sa temperature as that of the surrou ing air, no air bubbles should be a lowed to remain inside. The wo having been filled, both openings a closed by screws.

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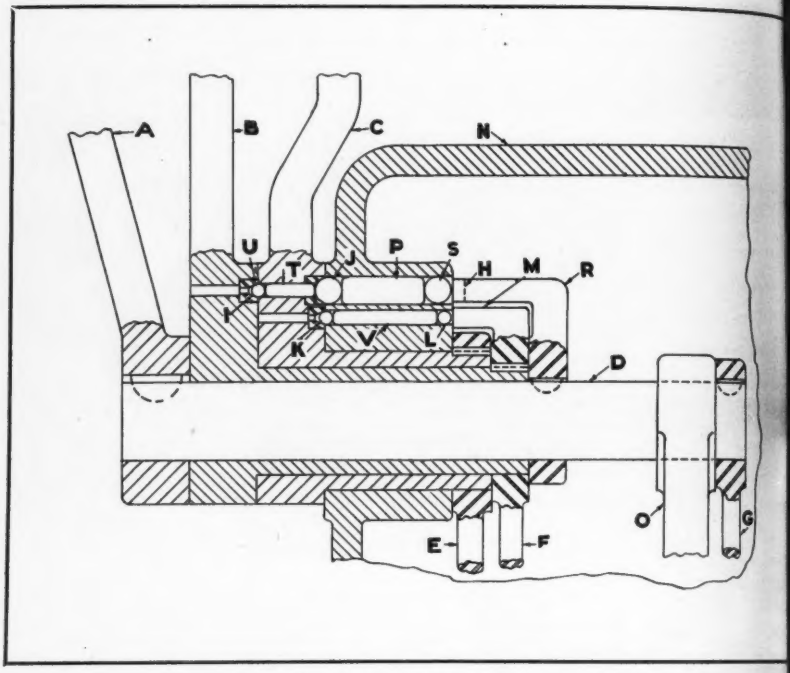


Drawing illustrating Design of Interlocking Gear-shift Levers

This non-elastic filling, which at the same time increases the mass of the part several fold, prevents both the generation and the propagation of vibrations and shocks caused by the tool, and thus enables the outer surface to be machined without regard to the accuracy and shape of the inner surface.

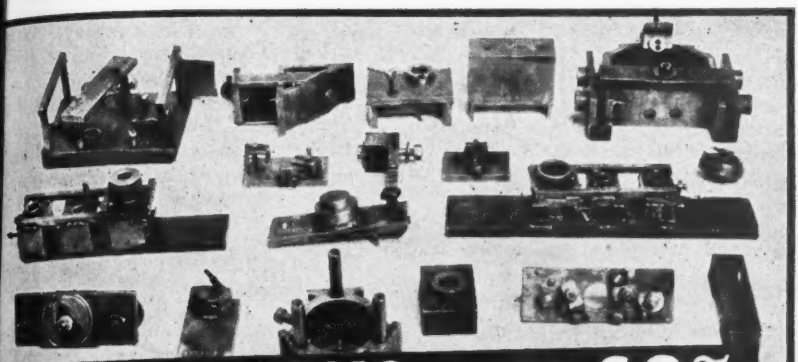
Interlocking Gear-Shift Levers

By J. E. Fenno

FELT washing machines in a news-print paper mill are equipped with gear boxes to vary the speed and direction of the endless felt belt in passing through the scouring solution. Two forward speeds and a reverse speed, obtained by means of hand levers, are provided for shifting the gears.

The design of the gear arrangement in the box was very much simplified by incorporating the interlocking lever mechanism shown in the illustration. The hand levers are indicated at A, B and C and the gear casing at N. Links E, F and G respectively are connected to the levers and serve to impart the required movement to the sliding gears (not shown).

All levers are in their neutral positions when vertical and are shifted in a clockwise direction with the operator at the left of the gear box. To prevent conflicting of the gears while shifting, levers B and C, which



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impart the two forward speeds, must be locked in a vertical position when the reverse lever A is shifted — and vice versa. Also, the shifting of both forward speeds cannot be done simultaneously but must be done in their correct order. That is, when all levers are vertical, lever B must always be shifted before lever C and returned in the reverse order.

With the arrangement shown, it is impossible for the operator to shift the levers other than in the manner described. For example, if the reverse speed is required, lever A is shifted in a clockwise direction. Sector R as well as lever A is keyed to the link shaft D so that the movement of this lever carries the vee-slot H in the sector past the ball S. Thus any end movement of members S, P, J, T and U is prevented so that levers B and C are locked in their vertical position.

Only by returning lever A to its vertical or neutral position can the levers B and C be shifted. Assuming that this is done and it is required to obtain the first forward speed, lever B is shifted. Obviously lever C cannot be shifted first since it is locked by balls K and L and the pin V which are held in their locked position by the sector M keyed to the hub of lever B. However, by shifting lever B, the sector M is moved into a new position so that a vee-slot (not shown) in this sector is located opposite ball L.

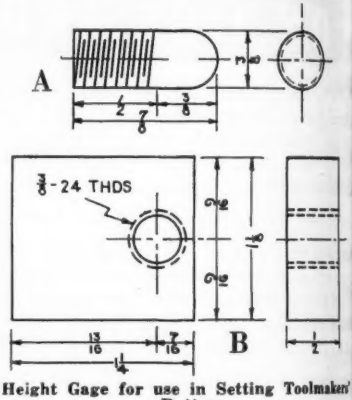
Now lever C can be shifted to obtain the second forward speed which action causes members K, V and L to move to the right, ball L partly entering the vee-slot in sector M. To return the levers B and C to their vertical positions, they must obviously be shifted in the reverse order.

All the requirements of this gear shift are met by the simple interlocking arrangement shown. However, the design is not limited to the application mentioned. It can be applied to practically any gear shifting apparatus. Moreover, by modifying the arrangement, the same principle may be adapted to any gear box having any number of shifting levers.

A Convenient Height Gage

By C. F. Fitz

THE drawing shows the design of a small height gage that will be found convenient in setting toolmakers' buttons especially when the buttons are to be located close to



Height Gage for use in Setting Toolmakers' Buttons

the edge of the work—which is a very common occurrence in jig and fixture work.

The gage consists of the height bar A, which screws into the base B. The piece A is of tool steel, hardened and ground, and the radius at the end of the piece is lapped to a true bearing after it is assembled to the base. Height bars may be made in a variety of lengths to meet the needs of the user.

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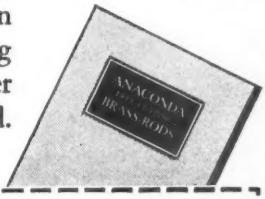

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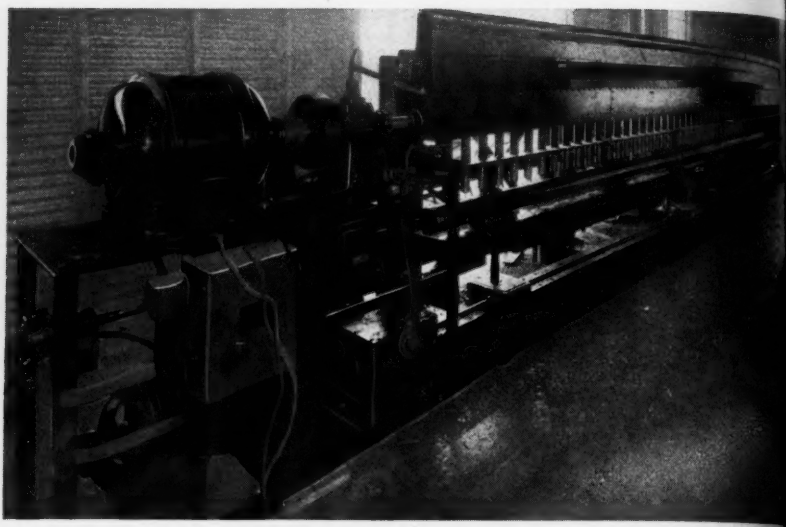

Giant Gang Drill for Drilling Perforated Pipe.

bar A and then measuring from the button of the base to the top of the bar with a micrometer. The gage is then used in the same manner as a regular height gage for setting the buttons. The gage may also be used with parallels, thus widening its range of usefulness.

Giant Gang Drill

By Elton Sterrett

EASILY doing a tedious day's work in forty minutes is the record of this improvised giant gang drilling machine, which was developed to answer the oil field's pressing demand for large quantities of perforated pipe. With its sixty spindles, all driven at the same time from one master shaft, it is possible to drill sixty evenly spaced holes in the time required for putting in one with the familiar type of single spindle drill press.

An innovation which simplifies machine design and at the same tim speeds the work is the plan of raisi the pipe with four simultaneously op erated jack screws, and thus feedi the work to the drills instead of fee ing them into the work. Heavy sprin actuated clamps hold the pipe rigidl while a separate stream of wat plays over each drill bit and permi highest drill speed.

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Over the Editor's Desk

The Significance

AS a display of new machines and equipment, the Machine Tool Show was a success, but to this observer the most significant thing about the show was the spirit of enthusiasm and expectation with which the whole atmosphere of the show was charged. After years of struggling through an almost interminable Slough of Depression, we have emerged and are once more marching on solid ground . . . moving forward toward a national prosperity that will equal . . . if not eclipse . . . any that has gone before.

Again we have within our grasp or in immediate prospect that greatest of all blessings—work. Work for shoe manufacturers, work for furniture manufacturers, work for automobile manufacturers, work for textile manufacturers, work for machinery manufacturers, work for all kinds of industries and, through them, work for the men and women of whom this nation is composed.

Those men who traveled long distances to see the Machine Tool Show were not just sightseers; they were looking for improvements that would enable them to increase production, reduce their piece-costs, and give their customers the benefit of better products at perhaps lower prices. The demand for commodities of all kinds is increasing rapidly, and those who are best equipped to serve their customers will be the ones who will get the bulk of the orders. These men could be found grouped about a grinder, examining the finish produced by a new type of grinding wheel, or noting the ease and smoothness with which a boring mill took heavy cuts with several tools at a time, or watching an operator demonstrate the flexibility of a new type of machi tool.

It would be a stolid man indeed w could return to his plant and his wo from a visit to the Machine Tool Sho without carrying with him some the spirit of progress and enthusias which was so evident at the show.

Business

INDICATIONS of a steady upswi in business are evident on all sid The indices of production and sal are confirming the forecasts of an u turn in trade this autumn. It is est mated now that the farmers will re a $7,000,000,000 harvest this year compared with $4,500,000,000 in 193 Railroads have held off on purchas of new equipment until they can ho off no longer and are now making u their lists. Electric power consume reached an all-time high in Augus The automobile manufacturers ha announced a $90,000,000 budget f plant rejuvenation, and already a siz able part of the money has be spent.

Of particular interest is the lar number of smaller plants that are b ing expanded to meet the increasi demands for their products. A surv reveals that hundreds of small i dustries all over the country are ope ating at capacity and in a great ma cases additions to plant buildings a under construction and new equipme purchases are being made. Althou large corporations affect the busine situation in proportion to their si and thus affect the prosperity of hu dreds of smaller concerns, it is on when the smaller plants are operati at capacity that we know that i dustry is in a thoroughly healt condition. And this situation exi at the present moment.

A Great Worker

Give this Nicholson File a tough filing assignment—let it tackle the metal that must be cut away quickly. This Nicholson File, like all Nicholson Files, is made to stand hard work, to lower filing costs, to get things done.

Made of the best file steel—teeth scientifically designed and constructed—tested for sharpness, durability and absolute uniformity to exclusive Nicholson File Standards. Every file with the Nicholson trade mark is a great worker of proved merit and demonstrated ability in workshops all over the world.

At hardware wholesalers and mill supply dealers. Nicholson File Co., Providence, R. I., U. S. A.

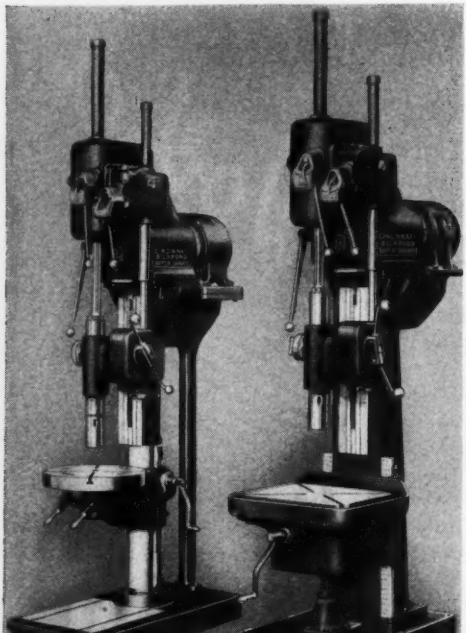
Genuine
NICHOLSON FILES

A FILE FOR EVERY PURPOSE

New Shop Equipment

Cincinnati Bickford Improved Line of Super Service Upright Drills

The illustration shows two of the improved line of Super Upright Drills which were introduced by The Cincinnati Bickford Tool Company, Oakley, Cincinnati, Ohio, at the Machine Tool Show in Cleveland. The drills are made in 21, 24, and 28-in. sizes and are built with either round or box column as shown in the illustration. The 24 and 28-in. sizes are equipped for 12 speeds of ranges from 60 to 1000 r.p.m. or 90 to 1050 r.p.m., and are provided with 9 rates of power feed. All speed changes are controlled by a single convenient lever and the 9 feeds are similarly controlled. The speed and feed levers are fitted with direct reading plates so that the selection of any desired speed and feed can be made almost instantaneously.



Cincinnati Bickford Upright Drills

An outstanding feature of these machines is the use of the reversing motor instead of mechanical reversing clutches for tapping. The lever at the left of the head operates push buttons which control the forward and reverse rotation and stopping of the spindle. A standard constant speed motor (having low starting current high torque characteristics) suitable for about 20 reversals per minute is used in connection with a magnetic reversing starter. The initial drive from the motor on the 24 and 28-in. machines is through hardened spiral bevel gears. The 21-in. size in this line provides 9 speeds in any one of 5 optional ranges and 4 feed rates.

The spindle and sleeve are of chrome nickel steel, the rack teeth being integral with the sleeve. The spindle is mounted in anti-friction bearings and the spindle sleeve bearing in the head has been increased as has also the length of the head bearing on the column. The spindle sleeve diameter has been increased to 4 in. on the 24-in. and 28-in. machines and to 2⅞ in. on the 21-in. machine. All possibility of damage to the rack and pinion has been eliminated by the incorporation of a spring bumper which cushions the spindle return.

The feed gears are now mounted on anti-friction bearings; thus the entire machine is 100 per cent anti-friction bearing equipped. The table on the box column machine is fitted with an adjustable taper gib and has an adjustable screw support under the center of the table. The machine can be furnished to suit individual requirements in the nature of multiple drill heads' flanged spindle sleeve, auxiliary guide for rigid drill head mounting, automatic spindle return, and other special features. They are also available in gangs.

Kingsbury Fleximatic

The center-column automatic indexing-type machine shown in the illustration has been developed by the Kingsbury Machine Tool Corporation, Keene, N. H., to perform a maximum of drilling, milling, threading, or analogous operations at an exceptionally high rate of speed. The various operations are performed with the aid of Kingsbury units, each with self-contained drive and feed. Due to the fact that the units can readily be located to suit the requirements of the job, there is almost no limitation in the scope of work to which the machine can be adapted.

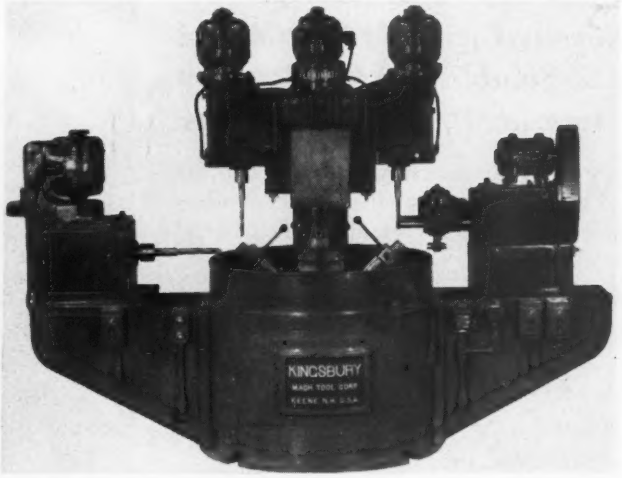
The rotary table or turret, carrying the work, revolves about a central column, the indexing being automatic and with harmonic motion in from one to two seconds. Power for indexing is supplied by a torque motor operating through worm and planetary gearing, the motor reversing after the table has been indexed to lock the table in working position.

The drilling units are tripped electrically through especially - designed solenoids as the indexing motor reverses to lock the table in position. The table can be indexed only if and when all spindles are in their retracted positions.

The method of operation of the machine is controlled by means of a three-position switch, which, when set in the proper position, will cause the table to index automatically at the conclusion of the longest operation, will require the pushing of a button to trip the machine, or will make it possible to "inch" the table out of working position. This feature permits moving the fixtures from their working positions to facilitate the changing of tools.

The machine can be furnished for 4, 5, 6, 7, 8 or more indexes of the table per revolution. All moving parts are automatically lubricated from a pump in the base of the machine, and the oil is filtered before being redistributed. The rotary table is 36 in. in diameter with finished surface for fixtures 32 in. in diameter. The height of the finished surface is 33 in. from the floor.

The No. 22 and 32 drilling heads used on the "Fleximatic" are designed with a positive cam feed of rugged construction. Power is supplied by standard-type NEMA frame motors and a lever is provided to hold the clutch disengaged so that the cam can be turned by hand through a wrench attached to a feed shaft. Cams can be changed by removing the left hand covers and feed gears can be changed by removing the right hand covers. Lubrication is entirely automatic.



Kingsbury "Fleximatic"

The unit bodies are of close-grained grey iron, and the quills are hardened and ground. Alloy steels are used wherever desirable, gears are hardened, and high grade ball bearings are used on all principal rotating members.

Reed-Prentice 14-In. 16 Speed Sliding Gear Head Lathe

The Reed-Prentice Precision Tool Room Lathe shown in the illustration has been placed on the market by Reed-Prentice Corporation, Worcester, Massachusetts. The 14-in. size is shown, but

A New High IN

Doubled Demand for Socony-Vacuum's New Cutting and Soluble Oils Results from Amazing Production Savings

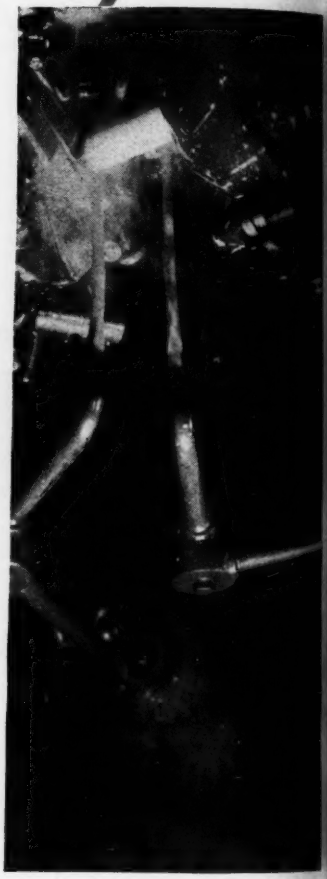
WHEN A CHANGE in cutting oil produces a 500% increase in the number of pieces per grind, that's important news in the metal working industry!

Just such increase took place when Socony-Vacuum Cutting Oil replaced a competitive oil in a shop which was forming, drilling, reaming and cutting off 2⅛" diameter hot rolled steel.

This is one example of the thousands of amazing performance records made by Socony-Vacuum's new Cutting and Soluble Oils—particularly the Sultran line . . . one reason why the sales of these new oils have doubled in the past year!

How Socony-Vacuum Engineers Can Serve You

Socony-Vacuum engineers are "experience-equipped" to advise you in the use of cutting oils and coolants. Their records prove that savings can be made even on jobs where management has been satisfied with previous costs. These engineers are ready to serve you . . . there's no obligation.



SOCONY-

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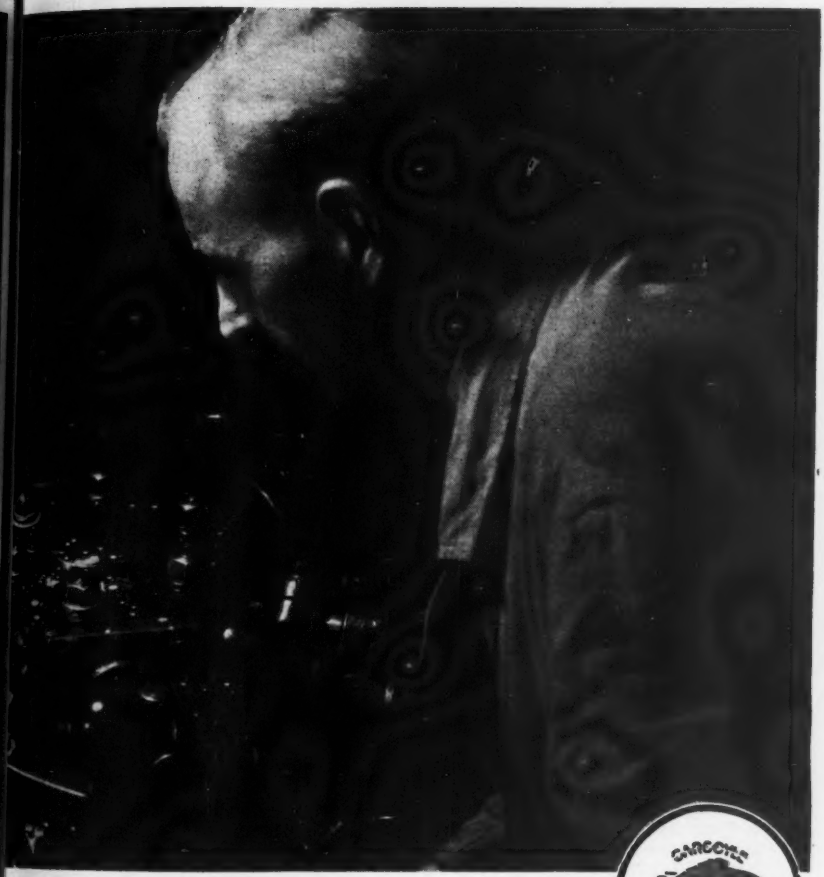
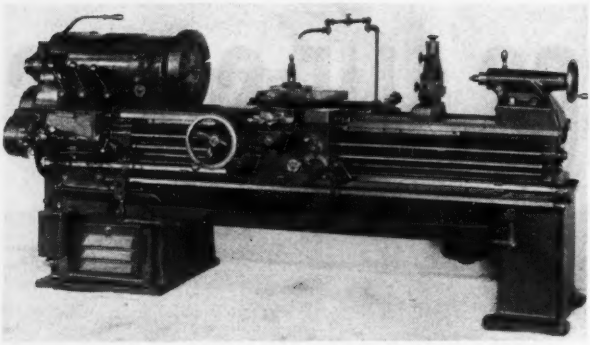
SAVINGS AND SALES



VACUUM OIL CO., INC.

WHITE STAR DIVISION - LUBRITE DIVISION - WHITE EAGLE DIVISION - PETROLEUM COMPANY - GENERAL PETROLEUM CORP. OF CALIFORNIA

Gargoyle Lubricants



Reed-Prentice 14-In. Precision Tool Room Lathe

the lathe is available in 14, 16, 18, and 20-in. sizes. Sixteen speeds are available, the speed changes being made through sliding gears mounted on multiple splined shafts for the operation of which but four levers are required, located at the front of the headstock. The speeds range from 18 to 536 r.p.m.

There are 49 changes of feeds and threads the number of threads per inch ranging from 1½ to 96 and the feeds ranging from 0.0025 to 0.160 in. per revolution. A built-in lead screw reverse mechanism is provided.

The distance between centers on a 6-ft. bed is 30 in. The apron is of box type with an oil pump providing lubrication for all bearings, bed ways, and carriage cross slide. A separate clutch control is incorporated in the apron for longitudinal and cross feeds. The carriage has a bearing on the flat of the bed and vertical face with adjustable taper gibs.

Headstock gears are of chrome nickel steel, hardened, with teeth ground on a Pratt & Whitney Gear Grinder. The spindle is equipped with four Timken Precision Bearings and with anti-friction bearings on the back shafts. The headstock mechanism is lubricated by means of a combined oil pump and splash system with filtration of oil to the main spindle bearings. The hole through the spindle is 1⅞ in. A No. 4 Morse Taper is provided in both the spindle and the tailstock.

Fellows No. 6 Hourglass Gear Shaper

The Fellows Gear Shaper Company, Springfield, Vermont, has placed on the market a new Gear Shaper particularly adapted to the cutting of hourglass worms for steering gears and reduction drives. This machine was introduced to the trade for the first time at the Cleveland Show.

Several interesting features are incorporated in the design and construction, among which is its ability to produce worms of great accuracy and smoothness of finish, and at a high rate of production.

In action, the cutter rotates in mesh with the work, and reciprocates at the same time that it is feeding in to the required depth. The work makes one complete revolution after the cutter has reached full depth, thus producing an extremely smooth finish.

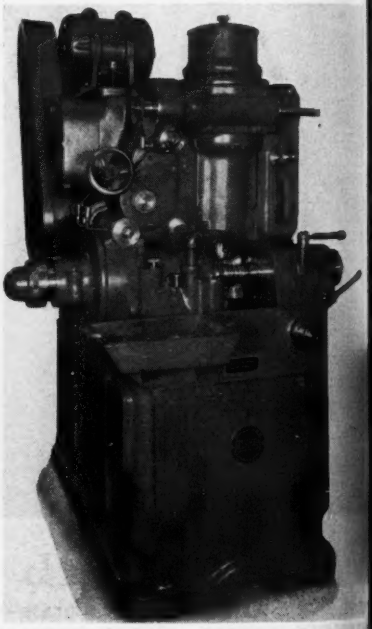


Fig. 1. Front view of Fellows No. 6 Type Hourglass Gear Shaper.

for
Alundum "C" Abrasive

IT'S a Norton abrasive that was developed especially for the more severe polishing operations. The grains are sharp for fast, clean cutting. And in order that their sharpness may be fully utilized—that they may cut till worn out—the grains are treated so the glue can grip them firmly. The result is a strong wheel head, equal to the most rugged work—a wheel that cuts fast and lasts long.

Many users are finding that these features of Alundum "C" Abrasive make it unequalled for heavy duty polishing jobs—that it often lowers polishing costs as much as 25%.

Try Alundum "C" Abrasive in **your** polishing room.

NORTON ABRASIVES

ding Wheels, Pulpstones. Laboratory Ware; Refractories; Porous Plates
sive Papers and Cloths. Norton Pike Sharpening Specialties.

The cutter is fed into depth by a feed cam, which advances the cutter towards the work at a definite rate. This cam is provided with a "dwell" for the finish cut. The same cutter is used for roughing and finishing. The cutter is withdrawn from the work on the return stroke by a relieving mechanism.

The saddle carrying the cutter-spindle is mounted on trunnions, permitting the saddle to be "rocked" back and forth for the cutting and return strokes of the cutter. Provision is made through change gears for cutting different numbers of teeth or threads, and for different depth and rotary feeds. There is also a feed reversing device for changing direction of rotation of the cutter-spindle for cutting worms having right or left-hand threads.

This machine is particularly adapted to motor drive and electrical control, and is easy to set up and operate. Capacity is governed to a large extent by the diameter of the gear that mates with the worm, the cutter having the approximate diameter of the mating gear.

Gray Turret Head Nibbling Machine

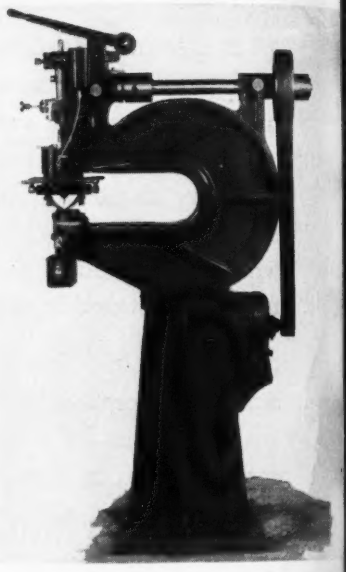
The line of Turret Head Nibbling Machines made by the Gray Machine Company, Box 596, Philadelphia, Pa., has been augmented by the addition of two machines of the type shown in the illustration—one of ¼-in. capacity with an 18-in. throat and the other of 3/16-in. capacity with a 24-in. throat. The machines are of identical design throughout except for the throat depth. The machine is especially adapted for cutting templets, jigs, metal gaskets, circles, rings, or stripper plates from the thinnest gages of sheet metal to the maximum stock.

The machine is motor driven. The turret can be revolved to bring the tool into any one of eight different positions and is equipped with twin strippers which are independently adjustable. When cutting to a templet, one stripper may ride the templet while the other may ride the stock. This provides even stripping action on both sides of the tool and eliminates pinching, tool break, and chatter due to uneven stripping.

The machine is equipped with a device which enables the operator to follow layouts easily and eliminates chatter and vibration. The device consists of a weighted screw which can be adjusted so that the weight will be kept just past center when the screw is tight against the shank of the stripper. Any vibration due to the impact of the cutting tool serves to further tighten the screw and makes it impossible for the screw to work loose.

Another feature of the machine consists in that it has a reservoir for cutting oils for lubricating the cutting tool, the reservoir being channeled and leading directly to the tool.

The turret head will operate 180 deg in either direction. The machine is sturdily and accurately constructed thro



Gray Turret Head Nibbling Machine

the cutting of alloy metals becomes a routine job. Only the finest steels, heat treated by a special formula, are used in the dies and cutting tools.

Rasmussen Power Saw Machine

The Rasmussen Machine Co., 1014 Eighth St., Racine, Wis., is now building the power saw machine illustrated herewith. The machine may be operated as a fully automatic unit when employed for cutting off duplicate pieces from bar stock, or it may be set to complete a cut and stop after the cut has been completed. Either square or angular cuts may be made as required.

For making angular cuts, the machine is swiveled on its base and set to the

now you can know at a glance a fast cutting, first quality file . . . .

RED TANG

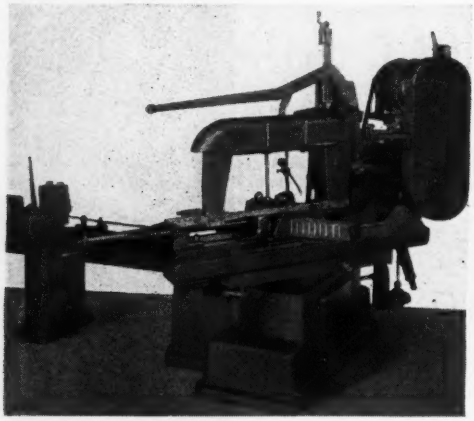
MADE BY SIMONDS METAL SAW MAKERS

A bright color — RED — on the tang, Simonds registered trademark, makes these the easiest Files to recognize. They are made in all lengths and standard shapes, Flat, Mill, Square, Round, Half Round, Taper, etc., etc., and in all standard cuts, Bastard, Second Cut and Smooth. Ask your dealer for these highest quality new RED TANG Files.

SIMONDS SAW AND STEEL CO.

Established 1832 Fitchburg, Mass.

desired angle as indicated by a graduated dial. Similarly, the vise on the machine is swiveled and set to the same angle so that the vise is brought back into line with the stock feed. This stock feed is furnished with a graduated scale by means of which settings are readily made for cutting off pieces of the desired length.



Rasmussen Power Sawing Machine

When it is required to cut off a specified number of pieces from a bar of stock, a dial mechanism on the machine is set to the number required. As each cut is finished, the dial moves through one space and continues to do so until the last piece has been cut, when the counting mechanism trips an electrical switch which stops the machine. In cutting duplicate work, the action of the machine is entirely automatic.

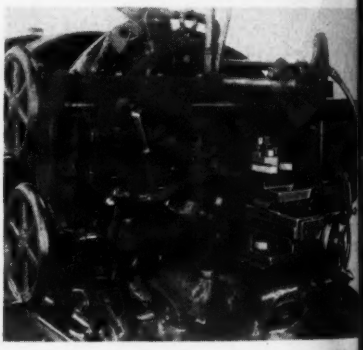
When set for automatic operation, the machine feeds the work for each cut and the saw will not feed down until the work is in position. As the saw starts feeding, the vise is automatically tightened and is released again at the completion of the cut. The saw returns to starting position at the end of each cut and the cycle is repeated. The saw cuts on the draw stroke, and a cam mechanism lifts the saw clear of the work for each return stroke. The saw blade and mechanism are safeguarded against damage in case abnormal conditions are encountered. The speed with which the saw is fed to the work is regulated by adjustment of a valve.

When the machine is set for automatic operation, should all the stock consumed before the required numb of pieces are cut off, an automa trip stops the machine. In addition use as a cutting off machine, machine may be used for d slotting and similar work.

Pipe Facing and Beveling Attachment for Landis Pipe Threading & Cutting Machin

Piping which is subject to usually high pressures and se temperature changes as in oil r fineries, chemical manufacturi plants, and so on, is now a sembled by the use of a type screwed joint which has a Whit worth Straight Pipe Thread an employs a gasket. To make th type of joint effective, in additio to the thread cutting operatio the pipe must be faced and be eled 20 deg. on the inside diam eter and a recess must be cut the shoulder of the thread. Th finish must be smooth and ma chined surfaces must be absolut ly concentric.

In order to combine the several ma chining operations with the cutting the thread, the Landis Machine Com pany, Waynesboro, Pennsylvania, has de veloped a facing and beveling attach ment for use on the Landis Pipe Thread ing and Cutting Machine. While th



Landis Pipe Threading and Cutting Machi Equipped with Landis Pipe Facing and Bev ing Attachment

machine itself is of the standard ty the attachment is built directly into th machine and the machine is also fitt with a leadscrew. The illustration show

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OF HIGH SPEED DRILLING MACHINES

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QUART **$1.00**

½ GALLON **$1.50**

GALLON **$2.75**

5 GALLONS **$12.50**

a view of the cross rail of the Landis Machine with the attachment in place.

The facing and beveling attachment is equipped with adjustable cutting tools whose setting, once properly adjusted, remains constant. The attachment has a universal adjustment and will face and bevel all diameters of pipe within the range of the machine. The lead-screw provides the positive feed necessary to insure threads of correct form and lead. This feature is important on the larger diameters since the threads are straight and not tapered as is the case with the ordinary screw joint.

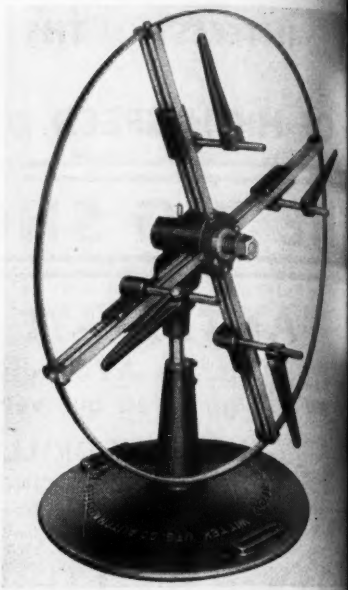
With this attachment the pipe is completely machined at one chucking, including the threading, facing, beveling, and recessing operations, thus insuring absolute concentricity of all machined surfaces. Vibration is eliminated due to the rigidity of construction and the wide speed range makes possible the required accuracy and finish.

Wittek Automatic Self-Centering Reel Stand

The Wittek Manufacturing Co., 4305 West 24th Place, Chicago, Illinois, announces a new and improved Automatic Self-Centering Reel for holding coil stock. This reel stand is equipped with four automatically expanding coil holders which slide up or down on the radial arms by means of auxiliary threaded shafts, which shafts are rotated by gears, simply by rotating the reel to the right or left with the gears in mesh. When adjusted to the desired diameter the gears are disengaged and locked into position by shifting the control lever on the gear box. The gears are enclosed in a dust-proof housing, packed with grease, requiring no further attention.

The radial arms and threaded shaft are guarded by a hardened rail and supported at their ends with a heavy retaining ring, which also serves to keep the stock from looping over the ar when the reel is inclined.

The four coil holders are always eq distance from the center, therefore



Wittek Automatic Self-Centering Reel Stan

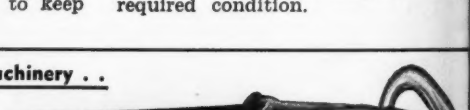
coil is always centered, assuring a pe fectly balanced reel which uncoils free

The reel is of heavy duty precision built construction and can be adjust to any angle. It will hold coils up 500 lbs., in weight, from 9-in. to 28-i open centers.

The reel is supported on a heavy ba and is adjustable for height to meet th required condition.

CLEAN Machinery is SAFE Machinery . .

The CLEMENTS —CADILLAC



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Really **CLEANS** any motors or intricate machinery—thoroughly, safely. Drives **DRY AIR**, free from oil or moisture at great velocity but low pressure. Removes dust, lint, wood or metal particles — reducing risk of "shorts" and "burn-outs", cuts down fire hazard and excess wear. Convertible to sprayer or suction cleaner.

CLEMENTS MFG. CO., 6655 South Narragansett CHICAGO, ILL.

Ask for **FREE** Trial

PLUNGED .100" into the wheel for 10 SHATTERING passes!

Ten times across a 46 N aluminous oxide wheel taking a .100" depth of cut each time! Two inches of wheel stock removed in 10 passes! That's the severe test recently made with the Carboloy diamond impregnated dresser. And, despite this severe punishment, it's still good for hundreds of economical, troublefree dressings!

The Carboloy dresser can stand unusual abuse. It's fool-proof; it's tough; it's longlived. No remounting; no breakage; no lost diamonds. *Diamond results without diamond worries!*

Try the Carboloy dresser on any finishing or semi-finishing except form or step dressing. Priced from $10.00 up, the Carboloy dresser will save you money on every dressing. Free booklet on request.

PERFORMANCE DATA

Machine: Thompson Hydr. Surf. Grinder.
Size: 6" x 12" x 18".
Wheel: 10" x 1" x 5". 46-N Norton Alun.
Spindle: 1740 R.P.M.
Wheel Traverse—6.8" per minute.
Depth of Penetration per Pass: .100
Number of Passes: 10.
Total amount of wheel removed: 2".
Grade of tool used—Grade 104 ⅛" dia.
Price: $16.50 each.

CARBOLOY COMPANY, INC.
DETROIT, MICHIGAN
CHICAGO CLEVELAND NEWARK PHILADELPHIA PITTSBURGH

CARBOLOY DIAMOND IMPREGNATED WHEEL DRESSER
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Send us your FREE booklet describing the Carboloy Wheel Dresser.

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Company _____
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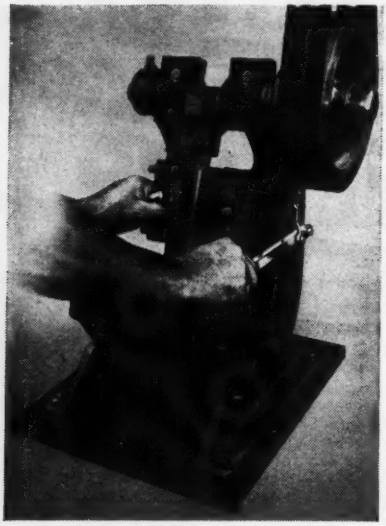
"Rouselle" Safety Device for Punch Presses

A new safety device for practically all sizes and makes of hand-operated punch presses, known as the "Rouselle", is now



"Rouselle" Safety Device Applied to a Punch Press

being introduced by the makers, David J. Ross Company, Benton Harbor, Mich. The extreme simplicity and positive safety of the new device are two of its main features, according to the makers. It consists of a bar, a one-piece housing, operating lever and long-life spring. Just a touch on the safety lever with the left hand when the press is tripped by the right releases the punch press lever. In this way, both hands are use and out of the way of danger eve time the press is tripped. And t safety device springs back into pla instantly when released, locking t punch lever securely. No extra time waste motion are involved.

The new device is also fool-proof, is pointed out. It cannot be put o of action, tied down or easily taken o The one-piece housing prevents tampe ing completely.

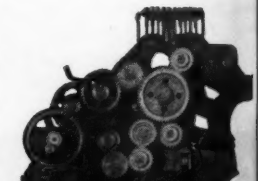
It is further claimed that any goo mechanic can install the "Rousell safety device in 15 to 30 minutes. T holes are drilled in the press for th safety bar, and two for set screws fo attaching, included with the devic The bar is sawed to proper length to f the particular press it is to fit, is the installed, the housing is put in plac and the screws tightened. Once on, n adjusting or further attention are re quired, and the device is guaranteed t last as long as the press.

Donganarc Welder

The Donganarc Welder illustrate herewith has been brought out by th Dongan Electric Mfg. Co., 2989 Fran lin St., Detroit, Michigan, to meet th demand for a small portable arc welde especially adapted for use in manufa turing, welding repair shops, and othe similar plants where the work is con fined mostly to sheet metal, light steel and iron castings. The machine wi operate most satisfactorily on iron an steel ranging from a minimum of 1/ in. in thickness to a maximum of ap proximately ¼ inch. It has been espe cially designed for use with heavy coate electrodes from 1/16 to ⅛ in. diameter.

The unit is completely housed in a steel case with a durable baked enam finish, a separate compartment in th case being provided for the weldin shield, electrode holders, leads, tool and so on.

Increase Your Machine Efficiency with
Automatic Lubrication
Blanchard Pulsolator Automatic Oil Lubrication Provides:
measured delivery of oil visible at each bearing when in motion.
increased production time and lowered oil and labor costs.
Write for descriptive bulletin B-5
RIVETT LATHE & GRINDER, INC.
BRIGHTON BOSTON, MASS.

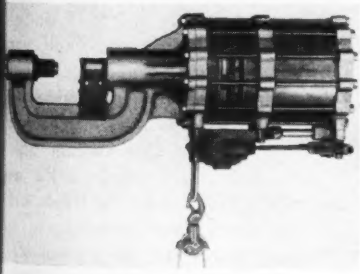


"Donganare" Electric Welder

The line connections to the welder are made by means of a specially-designed terminal block with terminals such that either 110 or 220 volt service may be used. The terminal block is mounted on one end of the case with the switch and output terminals on the opposite end. Thus the terminals are kept away from the output leads.

Hanna Portable Pneumatic Press

The Portable Pneumatic Press shown in the illustration is a development of the Hanna Engineering Works, 1765 Elston Avenue, Chicago, Illinois. Al-



Hanna Portable Pneumatic Press

though designed to fill the need for a portable tool to press spring shackle bushings and pins into automobile chassis frames, the press is finding general application for pressing, bushing, riveting, upsetting, and marking operations.

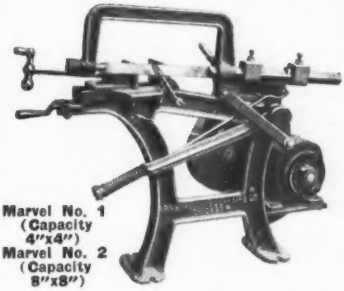
The press shown is tooled for pressing shackle bushings into an automobile frame. Equipped with a hopper feed for the bushings, the operator need only locate the index pin in the frame, operate the valve trigger, and the bushing is driven into place with a predetermined pressure. There is no need to start the pin or bushing in the hole prior to the application of the press.

Two cylinders, separated by a diaphragm, not only contribute to make this a very compact unit, but effect a decided saving in air consumption. The extensive use of aluminum alloy in the construction is reflected in the weight, which is 135 lbs. The press is available in capacities of 3, 4, and 5 tons. While standard yokes of varying reach and gap are offered, yokes are usually designed to fit the job.

Hydro-Motive Hydraulic Pump

A hydraulic pump the design of which is said by the manufacturer to be based upon a new principle has been brought out by the Hydro-Motive Company, 1001 West Washington Blvd., Chicago, Ill. The design involves the use of a flywheel such as is used on a punch press, a direct-connected 1200 r.p.m. motor being used to drive the crankshaft.

80% are Marvels



Marvel No. 1 (Capacity 4"x4")
Marvel No. 2 (Capacity 8"x8")

. . . of all dry cutting, general purpose hack saws in use today, more than 80% are MARVELS.

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"The Hack Saw People"
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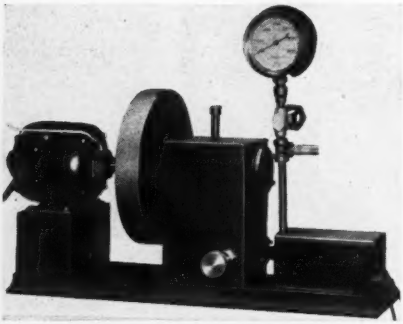


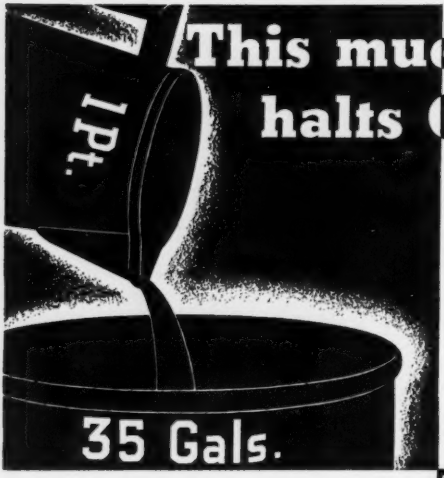
Hydro-Motive Hydraulic Pump

The crankshaft, which operates in roller bearings, reciprocates four pistons 90 deg. apart and also operates two two spool valves 10 deg. apart. Normally the fluid is circulated through an idling valve from the crank housing which is also on the reservoir. When the idling valve is in working position, the fluid is conducted through another spool valve with two outlets. This valve is controlled from a pressure-regulating valve so that when the fluid reaches a predetermined pressure, the valve is automatically moved and conducts the fluid through the second outlet. When the pressure in this outlet reaches a predetermined pressure, the idling valve is automatically returned to idling position.

The use of the flywheel makes it possible to operate the hydraulic cylinders at the same speed and economy as crank presses. The pump illustrated has ¾-in. diameter pistons with a ¾-in. stroke. It has a capacity of 5.6 gallons per minute, with a maximum working pressure of 5,000 pounds, and uses a 1/3 h.p. motor.

Smith Reel Roller Bearing

The Reel Roller Bearing shown in the illustration has been designed by The Smith Power Transmission Co., 1213 West 3rd St., Cleveland, Ohio, to eliminate the friction between the wooden reel and the steel bar upon which the reel is suspended. It is also intended



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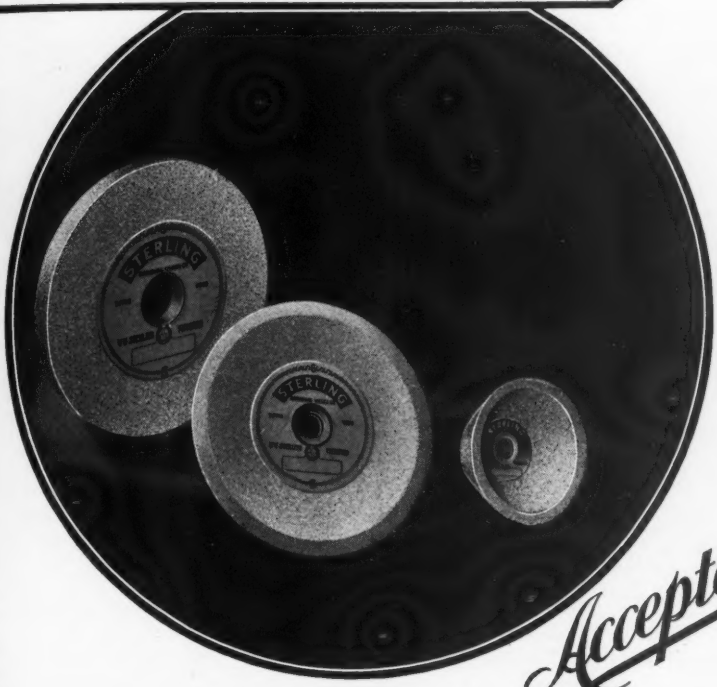

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COOLANT FILTRATION PERMITS USE OF FINER GRIT WHEELS WITHOUT "CLOG-UP"

Fine finishes demand clean grinding wheels. Free flowing, clean Coolant keeps wheels clean. The Fostoria Sorwal Filter solves the problems of maintaining the Coolant grit and dirt free at all times. It permits the use of a finer grit with resultant finer mirror finishes at lower cost. For example, one manufacturer formerly using a 50 grit wheel now uses a 70 grit and has increased crankshaft finishing from 560 shafts to 1140 shafts per wheel.

Test the money-saving improved production advantages of the Fostoria Sorwal Filter on one of your machines. Without obligation to you such a test will be arranged on request.

THE FOSTORIA PRESSED STEEL CORP.
Industrial Division - Fostoria, Ohio

SORWAL fostoria FILTER

for use between the reel bar and the type of reel bar holder which is used in some cases. The Reel Roller Bearing reduces the friction to such an extent that one man can operate one reel with ease and can move the reel fast or slow depending upon requirements.

The capacity of the Reel Roller Bearing is 6,000 lb., and the bearings will accomodate reel bars from 1 in. to 4 in. in diameter. The bearings themselves are made up with six hardened steel rollers operating on hardened steel studs.

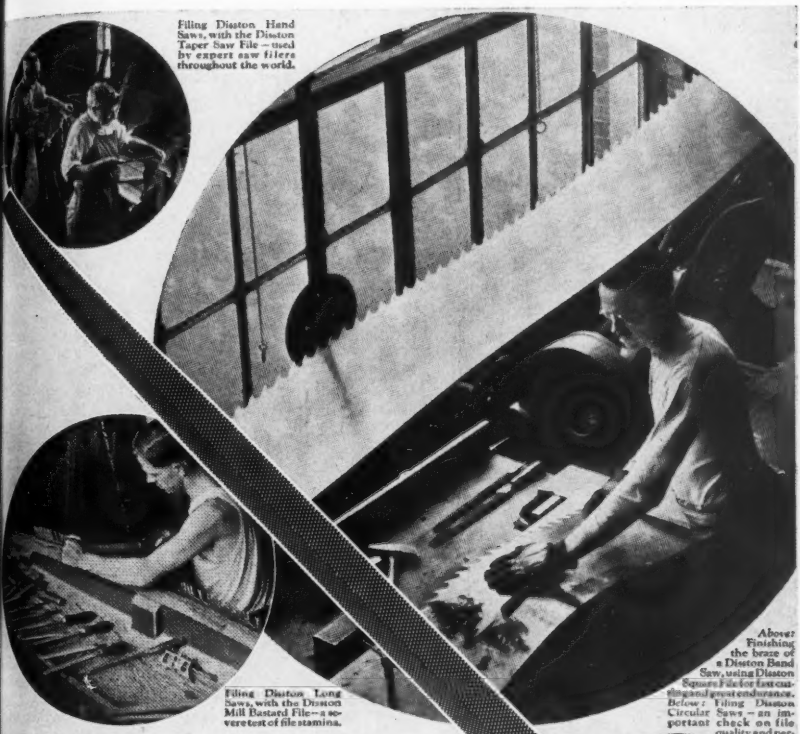
Smith Reel Roller Bearing

The bearing has a flat base and can be attached to any suitable support for handling wire rope or cable, rubber conveyor belting, or flat transmission belting on rolls.

Monarch Adopts Cam-Lock Flanged Spindle Nose

The Monarch Machine Tool Co., Sidney, Ohio, has announced the adoption of the American Standard Cam-Lock Flanged Spindle Nose as optional equipment on all sizes of Monarch engine lathes and toolroom lathes from 12-in. to 18-in. swing, inclusive. The advantage of the Cam-Lock type of spindle lies principally in the ease and quickness with which chuck plates and fixtures can be clamped to or removed from the flanged spindle nose. A chuck, plate, or fixture can be clamped to the spindle in a few seconds by the use of the square-end T-wrench that is furnished with each machine.

The entire spindle is hardened to approximately 60 Rockwell C. There are no loose parts, and all cams, studs, locks, and screws are hardened and



Filing Disston Hand Saws, with the Disston Taper Saw File—used by expert saw filers throughout the world.

Filing Disston Long Saws, with the Disston Mill Bastard File—a severe test of file stamina.

Above: Finishing the braze of a Disston Band Saw, using Disston Square File for fast cutting and great endurance. Below: Filing Disston Circular Saws—an important check on file quality and performance.

The Saw-Steel Test

Experience leads to improvement. Few industrial plants on earth have had *shop experience* in the USE of files to equal that of the Disston Saw, Tool and File Works.

And so,—using thousands and thousands of dozens of files every year in its own shops, the Disston plant became one of the world's largest industrial consumers of files and one of the most experienced producers.

Every year many thousand dozens of Disston Files go up against this saw-steel test.

And, through the years, just as Disston has worked to improve saws, so Disston has worked to improve files.

All this wealth of experience, all this investment in research and experiment, is capitalized to your advantage when you use Disston Files.

WRITE for Disston Metal-Cutting Manuals: "Files", "Hack Saws", "Circular Saws", "Band Saws", "Carboloy Products". Free!

SQUARE FILE.—Same basic Disston tooth design as built into Flat and Half Round Bastard files. Same keen bite, free cutting, same stamina and ruggedness. The file with the strong heart and long life.

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Canadian Factory: Toronto

DISSTON

ground. The spindle nose illustrated in the drawing is the size used on all lathes from 12 to 18 in. inclusive; thus chucks, plates, and fixtures are readily interchangeable on these machines.

Due to the fact that the chucks and plates are not removed on the larger

Flanged Type Spindle Nose used on Monarch Lathe Cam-Lock Type Spindle Nose

sizes of lathes as often as they are on the smaller sizes, the 20-in. to 36-in. sizes of Monarch lathes will be furnished with the regular Monarch 11-in. flanged spindle nose. The Cam-Lock Type Spindle can be furnished on these lathes, however, if requested. This spindle is the same in design as the Cam-Lock Spindle used on the smaller lathes, except that it is 11¾ in. diameter with a flange 2⅜ in. wide.

Niagara 14-Point Engagement Sleeve Type Clutch

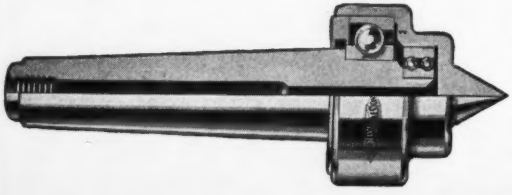
The Niagara Machine and Tool Works, 649 Northland Avenue, Buffalo, New York, has brought out the 14-Point Engagement Sleeve Type Clutch shown in the illustration. Prolonged life, instant engagement, increased number of strokes per minute, and added safety are said to be features of this clutch. The 14 engaging jaws contribute to long life by distributing the load over a striking surface having many times the usual area. The time lag between the instant of depressing the treadle and actual clutch engagement is practically eliminated, which contributes to increased production and safety.

Correct lateral acceleration is said to be provided by the shape of the engaging jaws, which also insures a positive concentric driving grip and provides for absorbing back lash. When the clutch is engaged, the shaft is controlled in both forward and backward directions.

Since the driving force is equally applied at 14 points arranged in a circle which is concentric with the shaft, there is no tendency of the driving force to bend the shaft. This concentric application of the driving force also eliminates the tendency to bind the sliding member against its guiding surfaces and avoids transmitting the shock of engagement to the clutch wheel bearing, thereby permitting the use of anti-friction bearings in the flywheel or main gear.

The 14-jaw clutch face is a solid hardened and ground alloy steel forging. It is secured to the clutch wheel by a unique arrangement of especially shaped bolts and non-uniformly spaced holes. The hardened alloy steel clutch sleeve has 14 jaws which engage laterally with

STURDIMATIC LIVE CENTER for LATHES, GRINDERS and MILLING MACHINES



It turns with the work. Eliminates friction of dead center.

Lowest possible overhang prevents vibration and chatter.

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Weighs 12 ounces. 6" long, 1⅝" in diameter. Fastest and most powerful portable tool for its weight and type ever developed. Price $18.50, complete with 6 Chicago Mounted Wheels. 10 Days Trial.

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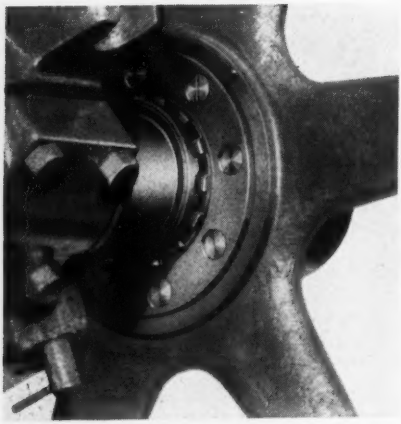

Niagara 14-Point Engagement Sleeve Clutch and Clutch Face

those of the wheel facing. When the wheel is engaged, driving energy is transmitted to the crankshaft by 26 internal splines generated on the inside of the clutch sleeve bore which mesh with corresponding external splines on the crankshaft. The 26 splines provide 26 possible positions of the crankshaft.

When the treadle is depressed, a large concentric spring slides the clutch sleeve into engagement. At the end of the stroke the sleeve is positively withdrawn by a cam race machined in the sleeve which is engaged by a hardened alloy steel follower spindle mounted in anti-friction bearings. A positive locking device is built in the throwout to prevent accidental engagement of the clutch when setting dies. A non-repeat device prevents a second stroke of the slide even when the treadle is held down. The device may easily be disconnected however and the clutch will then remain in engagement as long as the treadle is depressed.

Packer Automatic Applicator for Feeding Composition

Users of Packer Automatic Buffing Machines or other similar machines can now further increase their hourly production by the use of the Packer Automatic Applicator shown in the illustration. The Applicator, a product of the Packer Machine Co., Meriden, Conn., ap-

NEW DESIGN - - Heavy Duty Drill Press $32.25 less motor

The new design makes these tools more compact and stronger. Suitable for production work to closest standards of precision. One automotive company has been running a battery of these same presses many months, 22 hours a day, boring 750 holes per hour at spindle speed of 5200 R.P.M. ATLAS DRILL PRESSES STAND UP because they have 4 large deep-groove S. K.F. bearings—2 in head, 2 in quill—and are quality built throughout.

Four sizes, bench and floor models. Price range from $14.45 to $39.45. New catalog is now ready. Get it from your supply house or write us direct.

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ATLAS QUALITY
Shop Equipment Since 1911

"I get paid for being accurate. It's my bread and butter. That's why I'm choosy about the tools I use. A fellow can't take any chances these days. I stick to the tools I know I can trust—and that means Starrett Tools. *'I don't worry when I work with Starretts. When they say I'm right you can bet your life they mean it."*

Your men do better work with Starrett Tools. See that they get Starretts when they check tools out of the crib. Have you a copy of Starrett Catalog No. 25 "MD"? Write for it now.

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World's Greatest Toolmakers
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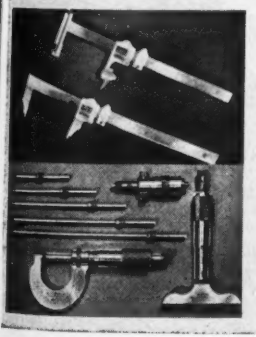
Steel Tapes—Standard for Accuracy

Athol, Mass., U. S. A.



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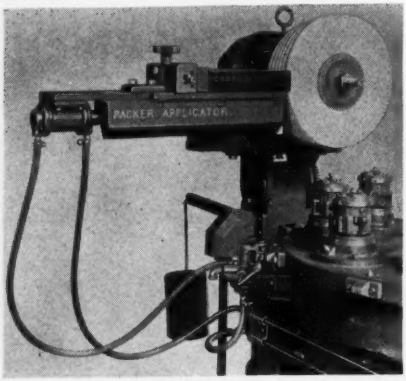


Packer Automatic Applicator for Feeding Composition as applied to Packer No. 1 Rotary Buffing Machine

plies composition to the buffing wheels automatically, in the correct amount and at the right time, thus eliminating the loss of time required to apply the composition to the wheels by hand.

The operator simply sees that the Applicator is supplied with composition in cake form, the application of the composition being governed by the travel of the work table. The maximum size of cake accomodated is 6 in. wide, 1½ in. thick, and 11 in. long. Pressure for operating the Applicator is obtained by the use of compressed air, for which a maximum pressure of 60 lb. is required. The feed-pressure is adjusted according to the work involved. The jaws can be adjusted to hold cakes smaller than the maximum size, and the cake is used down to the jaws of the Applicator.

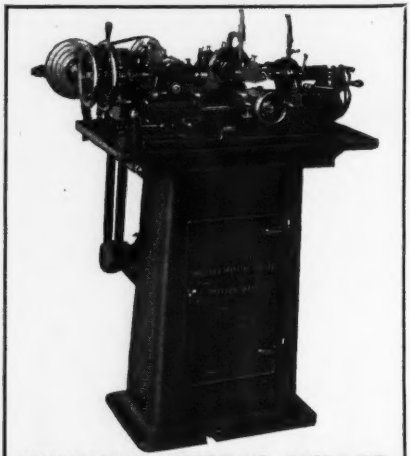
The Applicator is said to improve the finish on the work as a result of uniform application of the composition. The illustration shows an Applicator attached to a Packer No. 1 Rotary Buffing Machine.

Ettco-Emrich Tapping Attachment

A tapping attachment for use on drill presses or with any source of power with practical speeds up to 2,000 r.p.m. has been introduced by the Ettco Tool Co., 594 Johnson Ave., Brooklyn, N. Y. To distinguish the attachment from the other attachments made by this firm, it is known as the Ettco-Emrich. Two sizes are available; the No. 100 for #-in. taps and the No. 200 for ¼-in. maximum.

Ettco-Emrich Tapping Attachment

Drive is obtained through the use of sensitive cone friction clutches, so proportioned that they will slip before



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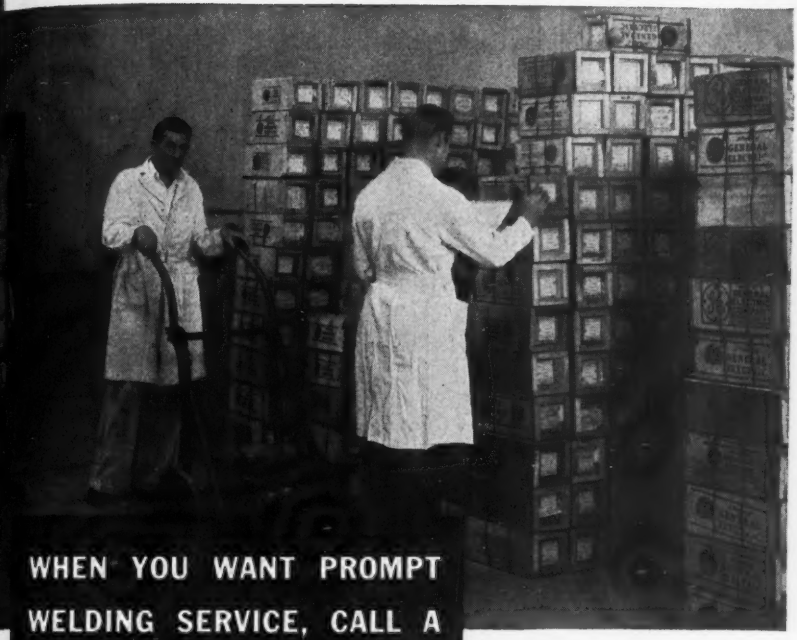

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Koebel Multi-Point Tools provide a number of small, whole, natural diamonds set in spaced relationship: from two to five sharp diamonds in contact with the wheel, each taking its share of the total burden. This permits faster traverse, a finer, more uniform dressing, providing a higher work finish, more parts per dressing, and longer wheel life. They will hold-size for any width of face.

No re-setting is ever necessary. *The Diamonds are mounted in Koebelite (patented process) guaranteed to hold them rigidly for their entire useful life. The metal will not load or glaze, but grinds away freely as the diamonds wear.*

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KOEBEL
DIAMOND TOOLS

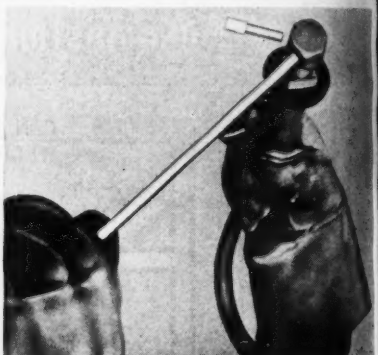
breaking even when bottoming in a blind hole. No adjustments are necessary. The reverse speed ratio is 1¾ to 1.

The entire mechanism of the attachment is contained in an oil-tight case and runs in an oil bath, the oil being circulated by means of a system of baffles forming a centrifugal pump. The cone clutches are of an entirely new material with an oil and wear-proof asbestos-carbon friction surface which maintains its coefficient of friction when running in oil.

All gears are helical with compound reversing idlers to balance the thrust. Ball bearings are used for the driving and reverse clutch shells. The idler gears run on nitralloy shafts with loaded bronze bushings to which oil is directly pumped. The case cover can be removed for cleaning. Several styles of cases are furnished with attaching means for portable drills, electric motors, special machines, and so on.

Metalweld Navy-Type Electrode Holder

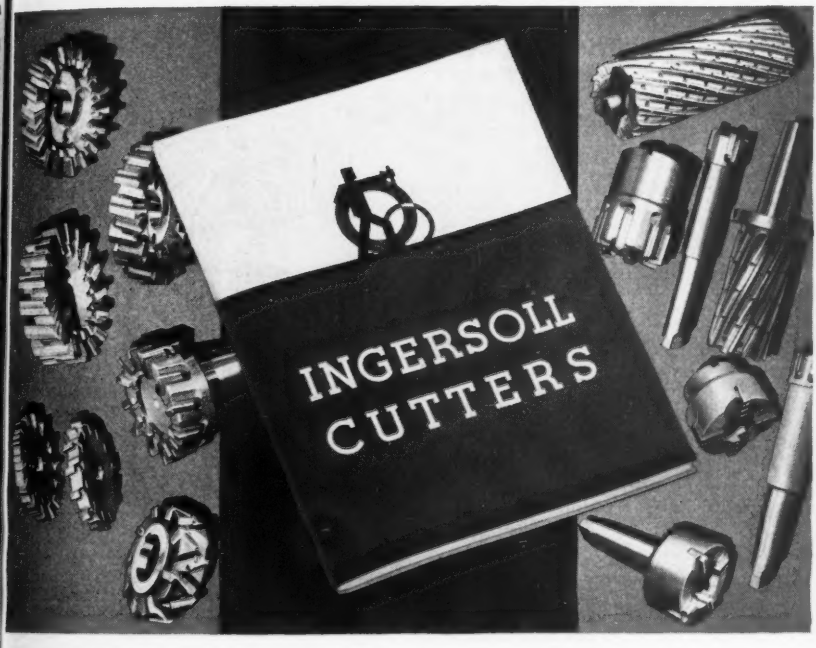
An electrode holder which is said to positively eliminate poor contacts along the path from the generator to the electrode and thus prevent the most frequent cause of porous welds has been announced by Metalweld, Inc., 26th and



Metalweld Navy-Type Electrode Holder

Hunting Park Avenue, Philadelphia, Pennsylvania. The holder is known as the "Navy-Type Electrode Holder" and is said to provide positive rod contact, eliminate springs, lever and soldered joints, prevent the handle from heating and—due to its long fibre handle—permit the welder to grasp the holder close

Get this Book on METAL CUTTING TOOLS



Send for your copy of the Ingersoll Cutter Catalog. You will find it very helpful in selecting the correct cutter for any kind of a milling, boring or facing operation.

The book contains numerous illustrations of special tools that will suggest beneficial ideas . . . also pertinent information regarding metal cutting materials, feeds, speeds and small tool design.

HAVE INGERSOLL ENGINEER YOUR CUTTING TOOLS . . . STANDARD OR SPECIAL

THE INGERSOLL MILLING MACHINE CO.
ROCKFORD, ILLINOIS, U. S. A.

to the electrode, thus assuring complete control of the electrode under all conditions. These features, coupled with simplicity of design, make it an ideal holder for all types of arc welding work.

The holder holds the electrode in a vise-like grip, yet a slight twist with a fresh rod releases the old stub and another twist in the opposite direction places the new electrode in the jaws of the holder. There is no heating, thus the operator's hands remain cool.

Thor "Perfect" Balancer

Thor Complete Line of "Perfect" Balancers

The Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill., announces a complete line of "Perfect" balancers in capacities up to and including 200 pounds. The Thor Tapered Drum, one of the outstanding features of modern balancer construction, is featured throughout the entire line and assures perfect balance of the load at any point within the range of travel.

Among the features which combine to enable Thor Perfect Balancers to meet every problem involved in the handling of weights up to the capacity indicated are enclosed housing, safety device, swivel ball bearing hooks, cable, cable guide, and the Thor adjustment feature. Four sizes in the Thor line of balancers are equipped with a locking and unloading device.

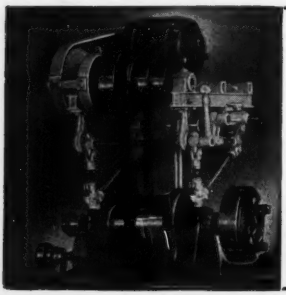
Bruko Non-Ridge Polishing Wheel

Bruce Products Corporation, 5712 Twelfth Street, Detroit, Michigan, has developed a Non-Ridge Polishing Wheel, said to represent a major improvement in wheel construction. It is called the Bruko Non-Ridge Polishing Wheel, and is constructed with sections which offset

Bruko Non-Ridge Polishing Wheel

the effects of glue seams so noticeable on the conventional type of wheels.

The manufacturer states that the Bruko Non-Ridge Wheel can be "set-up" with fewer glue and abrasive heads than has been possible heretofore, thereby giving the proper cushion to start with



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That the blades will not slip is known to those who have used

G&G & G&G

INSERTED SERRATED BLADE MILLING CUTTERS

This construction permits the blades to be adjusted in the most advantageous manner, the ratio of adjustment of side and top cutting edges is not limited by mechanical construction.

GODDARD & GODDARD CO.

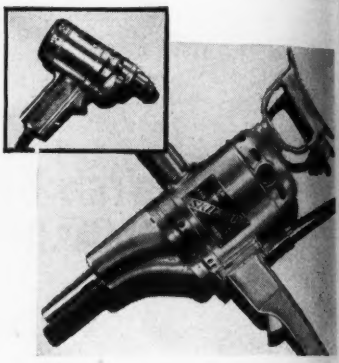
DETROIT, MICH.

and eliminating mechanically in its operation the grooves and ridges produced on all operations with the conventional wheel.

The Non-Ridge principle is used in the manufacture of muslin, canvas, sheepskin and leather wheels. Sizes and density to meet numerous requirements, whether for hand or automatic polishing, are available.

Skilsaw High Production Ball Bearing Electric Drills

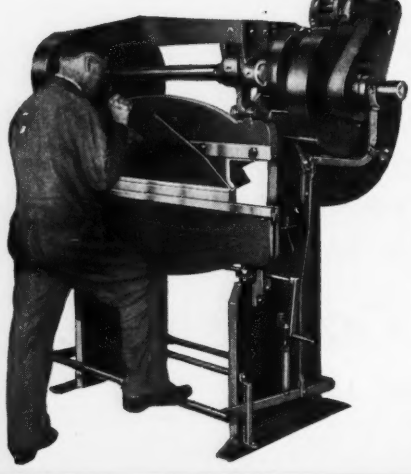
Five new units, consisting of two small drills and three large heavy duty models have been added to the line of ball bearing electric drills made by Skilsaw, Inc., 3334 Elston Avenue, Chicago, Illinois. The 3/16-in. and 1/4-in. High Production Drills have been designed essentially for assembly line work in the airplane, automobile, radio and refrigerator field and in other industries where exceptionally fast drilling of holes up to 1/4-in. diameter is required. Both models are compact, light, and of powerful construction. They are 7½ in. long by 3 3/16-in. diameter, with a die-cast aluminum alloy body that reduces weight, yet adds strength and durability. The handle is centered below the body of the tool, providing balance which gives the operator utmost con-



Skilsaw Ball Bearing Electric Drill

venience and freedom from strain. Smooth operation is assured by ball bearings on the armature, intermediate gear and spindle. The two-pole switch

THIS No. 253 CHICAGO STEEL PRESS



Will Do 40% to 60% of the Forming Work Turned Out by the Average Shop

This compact, ruggedly built, 48", No. 14 gauge capacity, Chicago Steel Press brake is an economical and profitable production unit. It is ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes and a great variety of sheet metal specialties. Variable speed drive operates from 17 to 50 strokes per minute. Precision built of highest quality materials by master craftsmen.

Write for Circular No. 253

DREIS & KRUMP MFG. COMPANY

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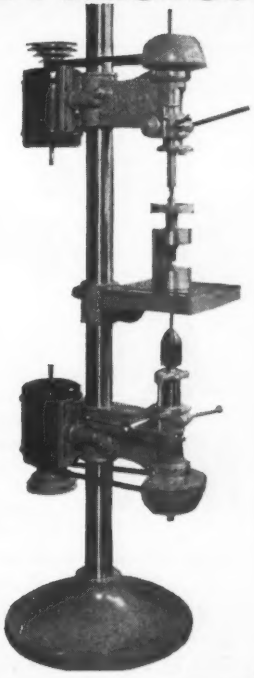
CUT PRODUCTION COSTS *with*

DELTA LOW COST DRILL PRESESS

Priced as low as $29.95 for the bench model, Delta Quality Slo-Speed Drill Presses are being rapidly adopted in hundreds of factories for many types of metal drilling. Their initial cost is small—yet the service they render is a revelation! Some of the largest industrial concerns in the country, after careful trials, are reordering Delta Drill Presses in large numbers. Their range of speeds enables them to be used in any general shop with drills from No. 60 up to 17/32 with utmost efficiency.

Any of the three "Slo-Speed" models, bench or floor type, can be supplied with "Delta-Grip" chuck, Jacobs Chuck, Tapping Attachment or Spindle for No. 1 Morse taper shanks. Floor model may be fitted with special production table. Write for full details about "Slo-Speed" Drill Presses and name of nearest dealer.



EASILY ADAPTABLE FOR SPECIAL OPERATIONS

Illustration to the right shows special Delta Drill Press model adapted for special operation—this is but one of numerous instances of special adaptions of these economical quality drills.

DELTA MFG. CO.

625 E. VIENNA AVE.
MILWAUKEE, WIS.

THE NEW SHELDON 11" LATHE

● **11¼ in. Swing . . . Two bed lengths . . . 24 and 36 in. center distances . . . 1 1/16 in. Spindle Hole.**

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

Ask for Bulletin No. 23.

Sheldon Machine Co.

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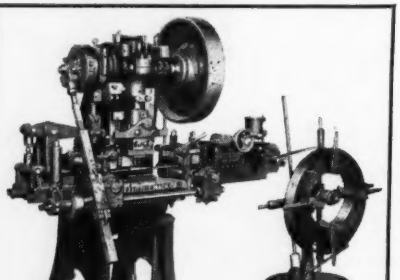


Meet demands for *Low Costs. Delivery* dates. the *Liability* insurance man with a smile.

Use Littell Punch Press Feeds for Safety & Speed

F. J. LITTELL MACHINE CO.

4127 Ravenswood Avenue, Chicago

Mfr's of Punch Press Feeds & Reels

is enclosed in Bakelite. Both drills are available in speeds of 2000, 2500, 3000 and 3700 r.p.m.

The ½-in., ¾-in., and ⅞-in. Skilsaw Heavy Duty Drills are of rigid construction, extremely powerful, and built to withstand hardest usage. Superior ball bearing construction brings smooth, vibration-free operation. There are two bearings on the armature, two on the intermediate gear, and three on the spindle. Helical cut gears provide for quiet operation. Housings are of die-cast aluminum alloy. A three-jaw geared chuck is supplied on the ½-in. and ¾-in. models, and the ⅞-in. model is equipped with a No. 2 Morse taper socket.

Foley Die-Making Machine

A wide range of changes and adjustments are possible on the Foley Die-Making Machine shown in the illustration. For this reason the machine, which is made by Foley Manufacturing Company, Inc., 11 Main Street, N. E., Minneapolis, Minn., is convenient and practical to use in a wide variety of work and on operations besides the usual die sawing and filing.

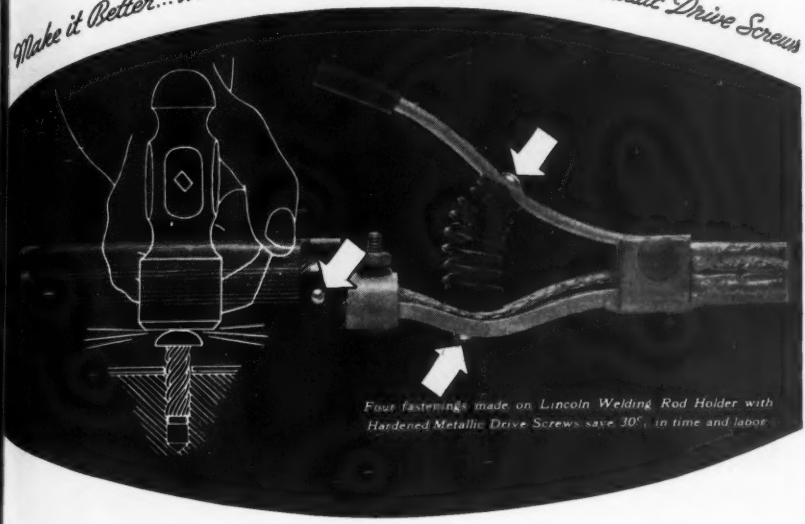
Any type of saw from the finest to the high power high speed saw can be used in this machine without changing holding fixtures. The chucks will hold any kind of a blade and no holes in the blade are necessary. Likewise all types of standard or special files from the smallest needle file to the coarsest bastard file can be used in this machine with equal ease and without special holding fixtures. The saw feed guide provides a positive, non-slipping feed quickly adaptable to all kinds and shapes of work—straight, curved or irregular—without the application of clamps or screws. An assortment of weights gives any desired tension on the feed. The feed mechanism is easily re-

EVERY SHOP needs these rugged, accurate, portable Pyrometers. L88 for checking **Surface Temperatures:** 800° range with 1 ft. silver tip couple, $17.90. L89 for **Non-ferrous Metals:** 1600° range with 2 ft. couple and 1 ft. replaceable tip, $19.30. L90 for **Furnaces:** 2500° range with 3 ft. couple. $19.00. Sent on 30-Day Trial. Circular Free.

RUSSELL ELECTRIC CO.
338 W. Huron St., Chicago

Hold-Heet Pyrometers

Make it Better... Make it Cheaper with Hardened Metallic Drive Screws



Four fastenings made on Lincoln Welding Rod Holder with Hardened Metallic Drive Screws save 30% in time and labor

Just like buying 85 Minutes of Work *for the Cost of Sixty*

Suppose that you, like the Lincoln Electric Co. of Cleveland, could save 30 per cent of assembly time and labor, and by using this saving could speed up production 30 per cent? Think how much more a workman could do in an hour! It would be just like buying 85 minutes of work for the cost of sixty.

Gains like that have been made by hundreds of concerns who have adopted Parker-Kalon Hardened Metallic Drive Screws for making permanent fastenings to iron, brass and aluminum castings, steel or plastics. Because of the extreme simplicity of application, these Screws are almost certain to reduce costs over fastening methods that require slow and costly tapping, unhandy riveting or bolts and nuts. Only one operation is required to use Hardened Metallic Drive Screws. You merely hammer the Screw into a drilled or formed hole . . . it forms its own thread as it goes in.

Nothing could be easier, quicker, cheaper. Yet, unbiased tests prove the fastenings are more secure than those made with common devices. This means better, as well as cheaper work. Investigate now; consider your fastening jobs. Send a brief description of any of them. We will furnish proper samples, FREE, with recommendations for making a test.

★

PARKER-KALON CORPORATION
Dept. M, 198 Varick St. New York

PARKER-KALON TYPE "U" HARDENED METALLIC **DRIVE SCREWS**

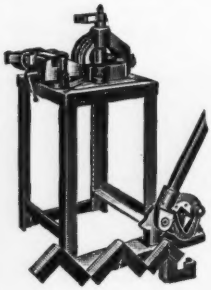
PATENTED No. 1,482,151 - No. 1,912,222 - No. 1,978,145 - No. 1,978,329

TRY THESE, TOO

Type "Z" Hardened Self-tapping Sheet Metal Screws
For joining and making fastenings to sheet metal up to six gauge; aluminum, die castings, Bakelite, etc. Simply turn Screw into drilled, pierced, molded hole. It forms a thread in the material as it is turned in. Can be removed and replaced.

Hex Head Hardened Self-tapping Cap Screws
For making fastenings to sheet metal from 24 gauge to 10 gauge, and also to steel plates and structural shapes up to 5/8 inch thick, brass, bronze, die castings, plastics. They function like the Type "Z" Screws but are driven with a wrench.

Parker-Kalon Products are sold only through recognized distributors



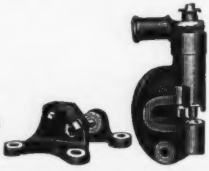
No. 455 Angle Iron Combination

Shears, Notches and Bends a 2" x 2" x ¼" angle iron in one minute flat.

Write for catalog on entire line.

No. 20 BALL BEARING PUNCH

Capacity ½" thru ½" iron



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With Tilting Table For Either Straight Or Tapered Bores

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Davis Keyseater Co.

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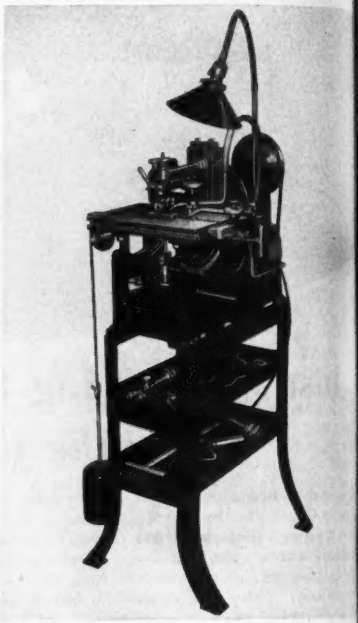
Rochester, N. Y.

moved, leaving the table clear for fil
Rollers at each side and back of t
saw support and guide the saw and
sure accurate cutting.

The table can be adjusted to any ang
without the use of wrenches or tools
any kind and without enlarging the ho
which is the pivotal center of the tabl
The ram, likewise, can be tilted rig
or left to any desired angle up to
deg. The ram has adjustment for we
and is counterbalanced to reduce



Foley Die-Making Machine

bration to the minimum. A blast of a
from a pump in the machine keeps th
work clean both for filing and sawing
The air is applied through a pipe whic
also serves as a hold-down and in such
a manner that the usual air nozzles ar
not required. All hold-downs are quickl
adjustable to any position.

The power application is such that
¼-h.p. 1725 r.p.m. single phase 60-cyc
110-volt A. C. motor provides ampl
power for the heaviest work. Motor
mounted on a pivot to insure prope
belt tension. The machine has a 6½-i
throat, making it possible to saw to th
center of a 13-in. piece and file or s

Standardized JIG BUSHINGS
Acme Standard over 6700 items
A.S.A. Standard over 4200 items

Acme Drill Jig Bushings are made by the most exacting, scientific methods—insuring long wear, accurate fit, and absolute satisfaction. A standardized product, carried in stock for prompt delivery in over 10,900 standard items—all completely finished and ready for use. Special sizes made to order.

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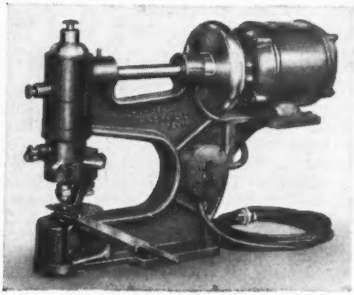
SAVAGE NIBBLING MACHINES

Are suitable for cutting shapes by template or to a line.

NO DISTORTION—NO SECONDARY OPERATIONS—NO OXIDATION



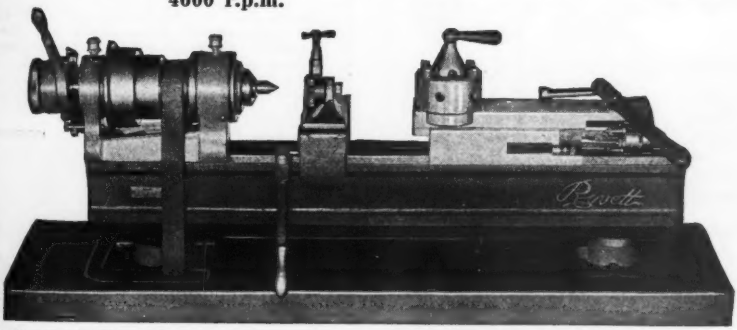
No. 109 BENCH MODEL—CAPACITY 1/8"
Capacities in mild steel up to 7/8"—
Throat depths 8" to 36"

ASK FOR BULLETIN B

W. J. SAVAGE COMPANY
KNOXVILLE Since 1885 TENNESSEE

RIVETT ANTI-FRICTION SPINDLE BENCH LATHES

are high production low cost machine tools for small bar or chuck work. 6, 12 or 18 selective speeds up to 4600 r.p.m.



Built with Timken Zero Precision roller bearing or Preloaded ball bearing heads. Collet capacity up to 1" diameter. Swing 8". Roller bearing lever chuck closer. Automatic six station turret. Cutting off and forming slide. Speed box drive with automatic brake. Oil pan.

Write for Bulletin 505-RB and price list.

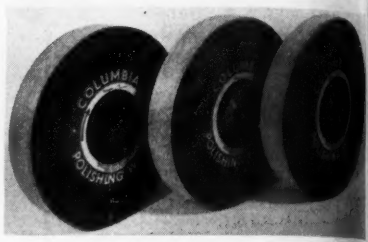
RIVETT LATHE & GRINDER, INC. BRIGHTON, BOSTON, MASS.

steel up to 3 in. thick. The table is 9x14 in. and is 41 in. from the floor. It can be tilted 20 deg. front or 10 deg. back. A stroke adjustment is provided from 0 to 4 in., and the machine will operate at 95, 135, 185, or 400 strokes per minute. The machine requires a floor space 22x19 in. and weighs, with stand, 322 lbs. complete.

Columbian Fibre Polishing Wheel

The Carborundum Company, Niagara Falls, New York, announces the introduction of what is said to be a distinctly new type of polishing wheel and which is being advocated for use in connection with Aloxite Brand TP and Carborundum Polishing Grain for all classes of metal and glass finishing work. The Columbian Wheel is produced by combining the strongest of vegetable fibres with a scientifically developed and controlled tough, resilient bonding agent. The result is the production of a wheel of even density and texture throughout. The manufacturer states that the wheel has no hard or soft spots and no ridges, and presents an unusually resilient cushion to the work.

The Columbian Fibre Polishing Wheel is made in three densities or grades; soft, medium, and hard. The wheels are "set up" with glue and abrasive in the conventional manner. It is to be noted that water, oil or grease have no deteriorating effect on the materials



Columbian Fibre Polishing Wheels

forming the wheel structure. To remove the old abrasive head, the wheel is simply washed in warm water or steamed without fear of change in wheel diameter or distortion of the wheel face. The wheel can also be dressed with dry pumice or an abrasive stick.

A distinctive feature of the Columbian Wheel is the specially designed metal hub, which is built into the wheel and

GRANT

RIVETERS — PIONEERS in their line—Head rivets from smallest to ½" diameter, either by NOISELESS SPINNING or VIBRATING HAMMER methods—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature—and don't forget to send samples.

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"with a Reputation"

Circle "R" products are made by an organization of experienced saw specialists. Properly used, they are guaranteed to give entire satisfaction.

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Fast, accurate modern machines require positive automatic lubrication to maintain top form. Banish the uncertainty of hand lubrication for all time by buying Bijur-Lubricated machines for your plant.

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Balancing Ways

No Leveling Required

A simple and excellent device for balancing straightening and trueing.

They are made in the following sizes:

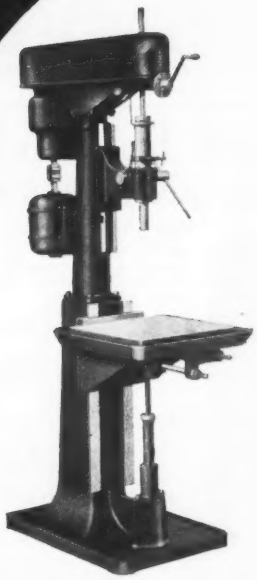
Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four Chilled iron discs rotate on sensitive special bearings

Write for Full Information.

Mfg. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St., Rockford, Ill.

FOSDICK



SENSITIVE ECONOMAX

Ideal for fast, accurate drilling. Speed-box on vertical back shaft is equipped with hardened alloy-steel gears and anti-friction bearings running in lubricant. No belt-shifting mechanism. Gear change lever is located directly in front of operator. Six spindle speeds. Capacity from ½" to 1½".

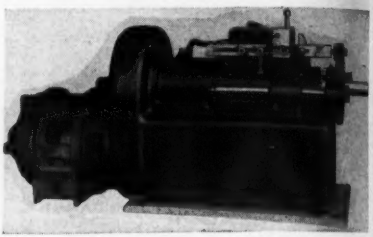
Write for Bulletin MS3

THE
FOSDICK MACHINE TOOL CO.
CINCINNATI, OHIO

perfectly centered. The hub provides for true, smooth running. Columbian Wheels are recommended on metal finishing operations where heretofore hard canvas, felt, and various types of compressed polishing mediums have been employed.

Hoefer Self-Contained Hydraulic Feed Drilling Unit

In line with the modern trend toward extreme flexibility in machine tool equipment, Hoefer Manufacturing Company, Inc., Freeport, Illinois, has developed the Self-Contained Hydraulic Feed Drilling Unit illustrated herewith. The unit is available in sizes from 1½ h.p. to 10 h.p. and can be used in any position — horizontal, vertical or angular. Thus the user is enabled to mount any number of units of varying sizes in any position either on a basic machine or upon special bases provided for the purpose. An important feature of the unit consists in the fact that it is especially designed for the adaptation of Hoefer Multiple Spindle Heads, thereby increasing its potential productivity.



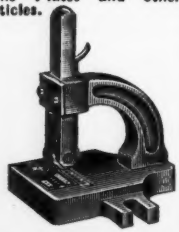
Hoefer Self-Contained Hydraulic Feed Drilling Unit

The base of the unit contains the sump for the oil. The motor is mounted directly at the rear end of the unit and the motor shaft connects directly to an intermediate shaft which, in turn, drives the geared pump which is located within the oil sump. Hardened and splined pick-off gears transmit power to the main spindle and permit variation of spindle speeds.

The main spindle extends through the hydraulic cylinder ram and is mounted at the front end in a plate which serves as an adapter for Hoefer Multiple Spindle Heads and is connected to the main base by guide bars thereby assuring the maximum of accuracy and rigidity.

Mark It Quickly with a NUMBERALL

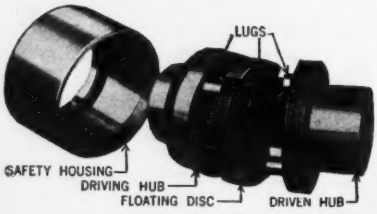
Made with 1 to 10 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping. Platform for stamping Name Plates and other small articles.



NEW Quick Set Machine
One wheel can be turned quickly by knurled knob for consecutive numbering.

Reasonably priced

NUMBERALL STAMP & TOOL CO.
Huguenot Park,
Staten Island, N. Y.



A NEW COUPLING

1. Self-aligning
2. Perfect flexibility
3. Balanced for high speed
4. Highest efficiency even at maximum misalignment
5. Angular misalignment up to 6°
6. Parallel misalignment 1/16" to 3/16"
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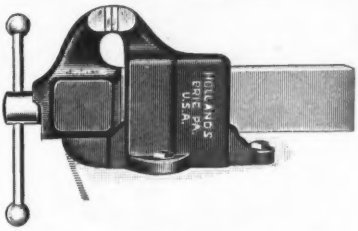
MODERNIZE
Your Vise Equipment



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OVERHEAD TRAVELING CRANES. Capacities: 1 Ton to 450 Tons. Types: Floor or Cage Operated with single or twin hook, auxiliary hoist, extension, grab bucket, close clearance, or submerged trolley. Bulletins describing Shepard Niles Cranes and Hoists in detail will be sent to you promptly on receipt of your request. **Shepard Niles Crane & Hoist Corp., 424 N. Schuyler Ave., Montour Falls, N. Y.**

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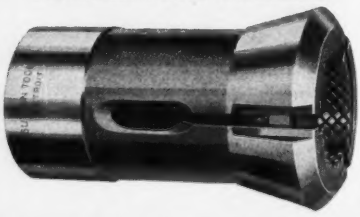
Write for Specifications and Prices
WESTERN TOOL & MFG. CO.
Springfield, Ohio

SUTTON COMPENSATING MASTER-TYPE COLLETS



Grip tighter under less pressure and strain. Conform to hot-rolled stock. Diamond-Serrated Pads are self-adjusting, interchangeable, and replaceable. Send for Catalog No. 11, showing full line of Sutton screw machine accessories.

SUTTON TOOL COMPANY
2840 W. Grand Blvd., Detroit, Mich.

with Diamond-Serrated Pads

The self-contained hydraulic circuit consists of a herringbone pump, an oil reservoir, a relief valve, a compensating feed valve, a reversing piston valve, and a cylinder and piston with through, hollow piston rod. The spindle passes through this non-rotating piston rod and is supported clear of it by ball bearings at each end. The control valve is so designed that, as resistance is met in the work, the back pressure on the piston is reduced proportionately, thus holding the feed rate constant regardless of work resistance.

The work cycle consists of rapid approach, working feed, and rapid withdrawal. While the rapid approach and withdrawal spindle are constant at 40 in. per minute, the rate of the working feed is subject to instantaneous change from 0 to 40 in. per minute by means of a knurled headed screw mounted on the hydraulic valve. The length of the feed stroke as well as the rapid traverse can be changed by means of trip buttons and any ratio between the length of the feed stroke and rapid traverse can be obtained within the capacity of each respective unit.

The unit is of symmetrical design and simple construction. All bearings are anti-friction.

Dessau Tri-Set Diamond Tool

The illustration shows the "Tri-Set" Diamond Tool which is now being marketed by Maurice S. Dessau, 6 Maiden Lane, New York, N. Y. The name of this tool is derived from the fact that each one of these three stones is first mounted in a steel plug, the plugs in turn being set into the tool and frozen solid so that they cannot move or be moved. Each stone is brazed into its setting, insuring 100 per cent service from each diamond. The manufacturer states that each diamond can be completely used all the way down to the end of the stone. This method of anchoring the diamond in its setting is said to eliminate the possibility of burning the diamond, consequently the maximum life of the diamond is obtainable.

Dessau Tri-Set Diamond Tool

GOOD DIAMONDS

Have no economical substitute

If your tools are marked like this, you have the best. Write for our illustrated catalogue on Diamond Tools.

JK SMIT SONS

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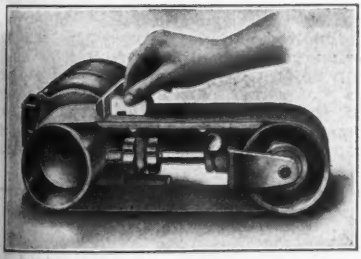
It's New

HANDY SPEED FINISHER



4" wide Abrasive Belt (other sizes up to 20" wide)

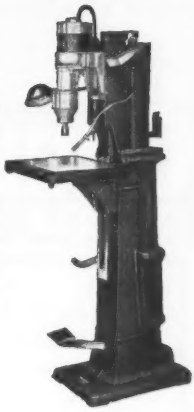
Saves a lot of time—filing, burring, straightening, etc. Very handy.

Write for Catalogue

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

THE HASKINS TAPPER

Every Tapped Hole as Accurate as the Tap Itself. Production Stepped Up to a New High.



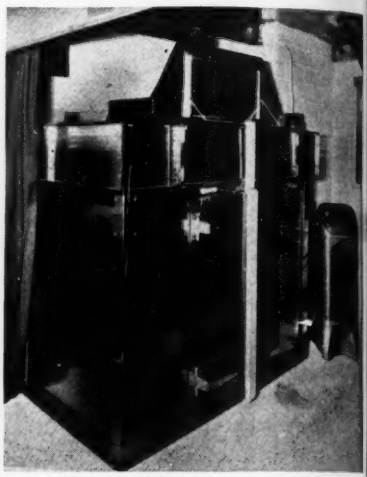
Perfect uniformity of tapped parts . . . a new high tapping speed that steps up production thirty, forty, a hundred per cent . . . an amazing new efficiency that eliminates tapping troubles and cuts tapping costs . . . All of these advantages are combined in the Haskins Tapper. Foot pedal control . . . rigid tap head construction . . . and many other refinements. An improved machine that has made possible an entirely **new** tapping method. R. G. Haskins Company, 4667 W. Fulton St., Chicago.

Send for illustrated booklet full of interesting facts on tapping production.

Haskins
FLEXIBLE SHAFT EQUIPMENT
with Greater Adaptability

X-Ray Equipment for Educational Purposes

In order to aid as much as possible in the teaching of modern industrial radiology, St. John X-Ray Service, Inc., 3020 Thomson Avenue, Long Island City, New York, has brought out an x-ray machine with which perfectly practical radiographs can be made. The machine was designed especially for classroom work and is intended to be installed in the heat treating laboratory of the engineering school. While not in the class with the standard industrial machine, the machine will produce correct radiographs and thus make it possible for the student not only to perfect himself as an industrial x-ray technician, but will also prove valuable in



St. John Industrial X-Ray Equipment for Educational Purposes

the teaching of foundry practice and other branches of metal working.

The x-ray equipment consists of a heavy lead lined cabinet enclosing a standard 200,000 volt x-ray generator and air-cooled tube. The x-rays are permitted to escape from the cabinet only through a single window in the top which is provided with a shutter which can be adjusted so that the area exposed to the x-rays can be varied from zero to the full size of the window. Two doors in front and movable panels on top permit access to the interior for

Columbia
TOOL STEEL

VANITE (18-4-2) High Speed Steel won the preference in demonstrating at Cleveland.

Information gladly furnished on request.

It pays to use Good Tool steel

COLUMBIA TOOL STEEL COMPANY
MAIN OFFICE AND WORKS
600 E. 14TH STREET CHICAGO HEIGHTS, ILLINOIS

HINGES
VARIOUS WIDTHS and GAUGES
BUTTS AND CONTINUOUS LENGTHS
WRITE FOR PRICES
For GUARDS CABINETS CASES BOXES
S & S MACHINE WORKS
4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS

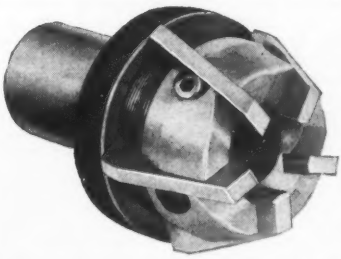
Exhaustive tests, constant use, new customers, increased business — prove that

LENOX
HIGH SPEED
HACK SAW BLADES

give longer service at lower cost; improve workmanship; save on production expense.

Try a box today.

AMERICAN SAW & MFG. CO.
Springfield, Mass, U. S. A.



GENESEE ADJUSTABLE HOLLOW MILLS

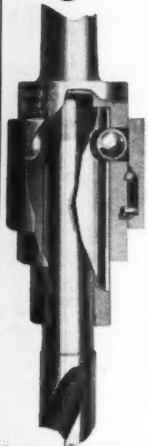
Are Cutting Costs Everywhere

SEVEN DIFFERENT STYLES

Have Genesee cut your costs. We design and manufacture hundreds of special and multiple operation production tools. Send samples or blueprints now. Write for catalogue.

GENESEE MFG. CO., Inc.
141 No. Water St., Rochester, N. Y.

Lightning Speed Changes



Sectional view of Titan quick change Chuck, Taper Shank Collet and Drill.

AND NO STOPPING WITH TITAN TOOLS! With your machines running at OPERATING SPEEDS . . . and with ABSOLUTE SAFETY, you can make tool changes with Titan Chucks and Collets! Strong, sturdy and ruggedly constructed, Titan Tools offer you the advantage of increased range—shortest coupled assembly—and smallest diameters! Guaranteed to give complete satisfaction!

TITAN CHUCKS . . . the only chuck with Slip Ring under spring tension! A distinct advantage, especially in turret lathe application!

TITAN TOOLS

TITAN COLLETS . . . eliminate use of key drifts—commonly used for separating tools and collets! No time lost hunting key drifts and hammer!

Write for bulletin.

TITAN TOOL COMPANY

FAIRVIEW • PENN.

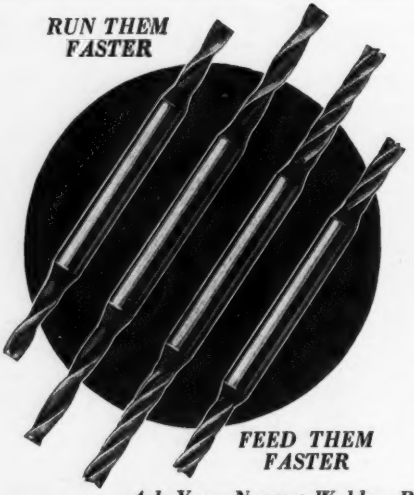
placing objects to be examined. A removable fluoroscope of special construction for indirect viewing of the x-ray image can be employed for certain teaching purposes. Another feature of the installation is a pinhole instrument for high speed high voltage x-ray diffraction analysis of metals.

While the installation is intended for the training of industrial x-ray technicians, it will serve as an important adjunct for many educational purposes. By means of diffraction patterns, the crystal structure of various metals can be checked before and after heat treatment. In foundry practice, the student can view his sand molds under the fluoroscope and see whether the mold is correctly made before he pours the metal. After the casting is made, an examination with the fluoroscope will show whether a good casting job has been done or whether gas and air vents will have to be changed in order to eliminate defects. Similarly, defects can be discovered in welded structures.

M. B. Super Speed Air Grinder

The illustration shows an air grinder which has been placed on the market by the Super Speed Air Grinding Co., Algonac, Michigan. The grinder is 5 in. long, weighs 8½ ozs. and develops approximately 100,000 r.p.m., which makes the tool particularly adaptable for fin

Super Speed Air Grinder



FASTER DIE WORK —AT LESS COST

THE HOLLOW-GROUND edges cut faster and stay keen longer. Double-end feature doubles metal removed between re-grindings. Made in standard and extra long flutes down to 1/16" dia. to work close into awkward corners and save hand-work.

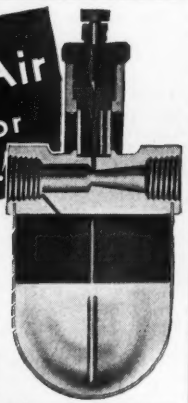
Note these Big Points

Quality Steel—Correct Design—Accurate Manufacture. Hardened by finest equipment obtainable. And there's no difficulty in getting them promptly—they're stocked in most principal cities.

Ask Your Nearest Weldon Representative for Prices

THE WELDON TOOL CO., 321 Frankfort Ave. Cleveland, Ohio

Oiled Air
a tonic for
your tools.



Oiled air stimulates tool energy—prolongs tool vitality. Feed every air tool and device a measured, adjustable amount of oil with the air that drives it, by means of a Norgren Sight Feed Automatic Air Line Lubricator. Keeps tools in condition, cuts repair costs, eliminates production delays due to "frozen" parts.

Sizes ¼ in. to 1½ in., prices $5.00 to $24.00

C.A. NORGREN CO., INC.
2018 Market Street
Denver, Colorado

PRECISION TAPPING
with the New
"PROCUNIER"
HIGH SPEED, BALL BEARING
TAPPING ATTACHMENTS

Smoother--More Sensitive--Compact

Double-Cone, Long Life, Cork Faced, Friction Clutch.
Three Sizes With Capacities up to ½" in Steel.
Also other Styles and Sizes.
Write for Literature.

PROCUNIER SAFETY CHUCK CO.
12 SO. CLINTON ST. CHICAGO, ILL.

SPEED UP NUT TURNING

A STRAIGHT-AHEAD RATCHET MOVEMENT
with the
FAVORITE
Reversible Ratchet
WRENCH

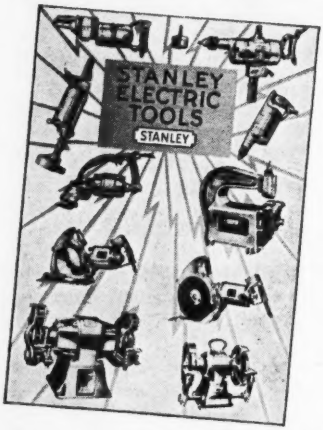
Does Not Leave Nut Until Operation is Completed. Opening in Head to Allow Bolt To Pass Clear Through.

A TIME-SAVER

Send for Folder

GREENE, TWEED & CO.
Sole Manufacturers
109 Duane St. New York, N. Y.

THE BIG NEWS
OF THE
ELECTRIC TOOL INDUSTRY
is included in
THIS CATALOG



A NEW, portable Unishear that cuts 14 gauge steel like paper; the Tool Room Grinder with a full ⅜ H.P. Universal motor; new electric drills with handy built-in drill gauges; new perfectly balanced, streamlined bench grinders—these represent developments in industrial electric tools offered by Stanley.

The Electric Tool picture is constantly changing. This comprehensive catalog shows the latest developments in the leading line of Industrial Tools.

Keep pace with these developments—Send for a copy of this catalog No. 64M.

THE STANLEY ELECTRIC TOOL DIV.
THE STANLEY WORKS
137 Elm Street, New Britain Conn.

A complete line of portable electric tools for industry

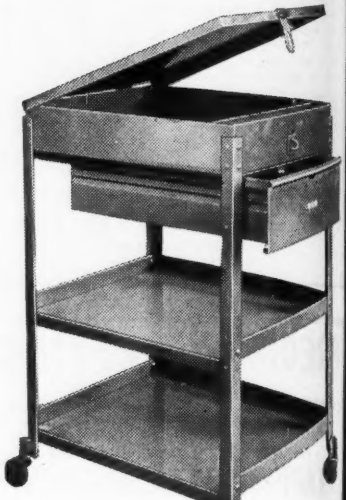
STANLEY

work on dies and tools.

The housing is of aluminum and the working parts are of a specially selected high grade steel. All parts subject to wear are hardened and ground. The shaft revolves in high grade ball bearings of a well-known make. The grinder is so designed as to be self cleaning, thus preventing dust and abrasives from entering the bearing surfaces.

Lyon Tool Toter

The illustration shows a portable steel stand, locker, and drawer, combined into a unit that has been placed on the



Lyon Tool Toter

market by Lyon Metal Products, Inc., Aurora, Illinois. The unit, known as the "Tool Toter", is intended for use either at the machine or on the assembly floor where a variety of tools are employed or where they must be within easy reach at all times. Tools or parts can be reposed on either one of the two trays, in the drawer, or they can be locked in the receptacle at the top. The Toter is made of heavy gage rolled steel and is mounted on four 2½-in. casters which make it easily portable. The Toter is 34½ inches high, 18 inches wide, and 24 inches deep.

STEEL STAMPING DIE

ENGRAVED ROLL DIE

STEEL STAMPS
ENGRAVED DIES

For Hand & Machine Operation

Builders of

HI-DUTY MARKING MACHINES

For Every Marking Requirement Since 1895

HAND TYPE HOLDER

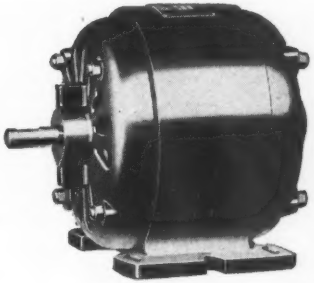
GEO. T. SCHMIDT, INC.

1806 BELLE PLAINE AV. CHICAGO, ILL.

Send for Catalog

Finely Adapted to Every Purpose

Among the wide range in types of Ohio Motors, machine tool builders will find the one which exactly meets every requirement.



Split Phase Induction Motors
Direct Current Motors
Permanent Split Capacitor Motors
Capacitor Start Motors
Capacitor Start and Run Motors
Polyphase Motors
Synchronous Motors
Torque Motors
Shaded Pole Motors

Also, A. C. to D. C. Motor Generators, and High to Low Voltage D. C. Dynamotors.

Sizes 1/250 to 1½ H. P.

Whatever your needs, give our engineers a chance to work with you.

THE OHIO ELECTRIC MFG. CO.
5918 Maurice Ave.
CLEVELAND, OHIO

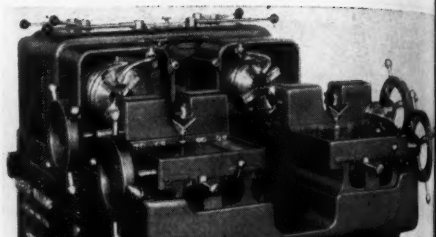
OHIO MOTORS

Oster-Williams No. 922 Bolt Machine

Among the new machines exhibited at the Machine Tool Show by Oster-Williams, 2057 East 61st Place, Cleveland, Ohio, was the new No. 922 Bolt Machine shown in the illustration. The design of the machine is new throughout, and it can be furnished in both single and double spindle types.

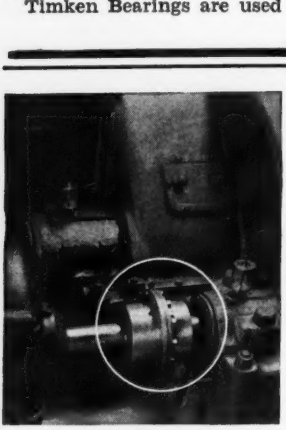
The machine is intended for high production on standard runs in bolt plants and for an extremely wide variety of special work in the metal manufacturing plant. Its regular bolt range covers all sizes from ½ in. to 2¼ in. at spindle speeds ranging from 32 to 196 r.p.m. A spindle bore of 3¼ in. and a vise adaptable to many different types of work holders provide for a wide range of work of special nature. The double-spindle machine is equipped with a mechanical reverse on one spindle so that both right and left hand threads can be cut simultaneously.

Timken Bearings are used throughout,



Oster-Williams No. 922 Bolt Machine

and the die head is of a fine grade tool steel, hardened and ground. A dies are of high speed steel. Spindl are of high carbon steel forgings, he treated and ground. All driving a change gears are of chrome nickel ste



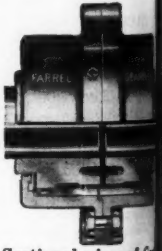
A No. 4½ double engagement type Gearflex Coupling on rolling mill drive transmitting 200 H. P. at 680 R. P. M.

FARREL GEARFLEX COUPLING

built to stand the stress of heavy duty service

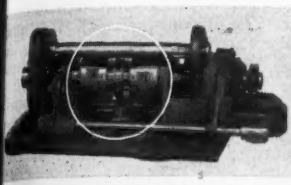
Power is transmitted through strong, accurately g erated gears operating continuously in oil. There no bushings, pins, springs or grids to wear out. Th simplicity, accuracy and rugged construction insure long life and dependable performance.

For complete engineering data, giving ratings, dimensions, weights, list prices, etc., send for a copy of our Bulletin No. 437.



Sectional view of Ge flex Coupling show gear teeth and chamber.

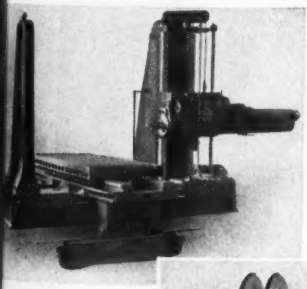
FARREL-BIRMINGHAM COMPANY, INC.
381 Vulcan St., Buffalo, N. Y.



SATISFACTORY PERFORMANCE
UNDER CONTINUOUS OPERATION

e had to obtain satisfactory rformance under continuous eration. This was accomished by using Twin Disc ose Coupled Duplex Clutches", rs K. F. Gallimore, Chief Enneer, Giddings & Lewis Maine Tool Co., Fond du Lac, s. "We have used Twin Disc utches for the past twelve ars, and they were selected r our new 30 series Precision rizontal Boring, Drilling and illing Machine for their — mpactness of design, allowing stallation in a minimum space . ease of assembly, as they n be built into the machine an assembled unit . . . simle and positive locked adjustent . . . dependability of opation. Considerable economies re obtained by reduction of rvice and replacement figures an extremely low figure." rite for engineering data. Spec recommendations on re-

in Disc Clutch Company,
26 Racine St., Racine, Wis.

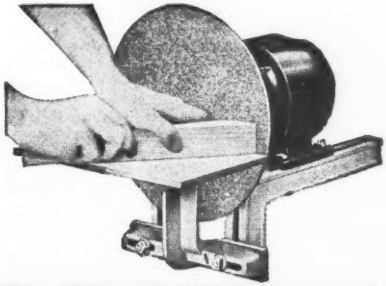


TWIN DISC CLUTCHES

The WYCO Line

Flexible Shaft Equipment

Sizes from ¼ to 1 H. P.
Prices $35.00 to $105.00
COMPLETE WITH ACCESSORIES



WYCO MOTOR DISC

Fits any motor, $15.00

WYZENBEEK & STAFF, Inc.
Manufacturers
642 Washington Blvd. Chicago, Ill.

No. 5 of the Series

WHAT ARE THE VARIOUS COATED ABRASIVES?

What Are Their Uses?

SILICON CARBIDE
(CLOVER BLUE-STRIPE)

By E. B. GALLAHER
Editor, Clover Business Service
Treasurer, Clover Mfg. Co.

IN OUR LAST AD we told you how Abrasive Belts were made—we now describe another electric-furnace product —Silicon Carbide.

• SILICON CARBIDE (carborundum) was invented by Edward Goodrich Acheson in his quest to produce a diamond. It is, in fact, a sort of dark-colored diamond — nearly as hard and quite as brittle.

It is made of silica sand, salt, sawdust and coke, which, when mixed in proper proportions, then fired by the enormous heat of a great electric arc until the mixture boils, produces a mass which, when it cools, becomes a crystalline structure of intense hardness.

These crystals are then crushed, magnetically cleansed, then chemically treated; after which they are graded for the arts, and, among other things, are employed in making abrasive papers and cloths, grinding wheels, sharpening stones, etc.

• SILICON CARBIDE is extremely hard and extremely sharp—BUT IT IS VERY FRAGILE. It is not tough like Aluminous Oxide. (See ad No. 3 of this series.)

It is little used for cutting metals, but it is extensively employed in the woodworking and leather trades, where sharpness and clean-cutting is essential.

In coated abrasives, it is made up on both paper and cloth backings, and is sold in rolls, in sheets and in belts.

Sil-Carb is almost exclusively employed in the shoe trade as well as in the tanneries. It is the most popular abrasive now used by the floor-surfacing trade.

• CLOVER BRAND SILICON CARBIDE Coated Abrasives all bear a blue stripe on the back of the sheet for identification.

• File these ads for reference.

CLOVER MFG. CO. NORWALK, CONN.

Also Makers of the Famous
CLOVER GRINDING AND LAPPING COMPOUNDS

heat treated and ground and runni in oil. Headstock shafts are aut matically lubricated and adjustable t wear. The vise carriages are of semi steel, and are rigidly supported.

The net weight of the double-spind machine, with motor and electric equipment, is 6,000 lbs. The height the machine is 48 in., width, 55¼ in and length, 84 in. The single spind machine weighs 4,500 lbs., is 48 in. hig 40 in. wide, and 84 in. long.

Schmidt Model 145 Pneumatic Hi-Duty Power Marking Machine

Letters and designs can be rolled in flats, rounds, or irregular surfaces to uniform depth by the use of th Schmidt Model 145 Pneumatic Hi-Du

Schmidt Model 145 Pneumatic Hi-Duty P Marking Machine

More Holes per Minute

And a better profit for you . . . . that's the result of applying U. S. Multiple Units to your drilling machines.

By specializing in the design of special Drill Head Units, we can easily meet your requirements of accuracy and economy.

Send blue prints for estimates.

The United States Drill Head Co.
1954 Riverside Drive
CINCINNATI, OHIO

A New "D & W" Chuck
Style S-7 x 17

A sturdy, dependable chuck, 3 9/16" high to meet demand for lower chuck than our standard F-7 x 16.

List price (including Demag. switch) $65.00.

List price (without Demag. switch) $55.00.

●

J. & H. ELECTRIC CO.
202 Richmond St., Providence, R. I.

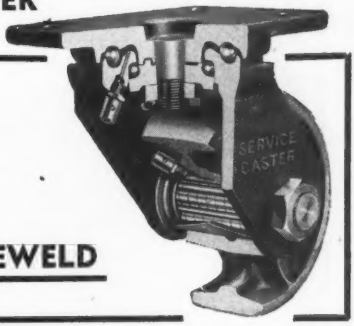
THE ONCE-AND-FOR-ALL CASTER

Let a House Fall On It!

You'll Never Replace It!

If casters that don't wear out interest you—If you'd like to specify a standard caster that will replace worn ones *once and for always*—Then let us tell you about the new Service ForgeWeld it took us 18 years to build. It's our finest caster, yet nowhere near our highest priced. If you know anything about stresses and caster design examine the cut-away view for the secret of the great strength. *Write for Full Descriptive Circular.*

THE NEW HEAVY DUTY **FORGEWELD**



Ni-Steel—Iron Wheel
One Piece King Bolt and Plate
Drop-Forged S.A.E. 1045 Steel
Brinell Rating 230
Machined Races—Service Ball Bearings
Hyatt Bearing Wheel
Alemite Zerk Lubrication

SERVICE CASTER & TRUCK CO.
596 N. ALBION ST., ALBION, MICH.

Power Marking Machine shown in the illustration. This machine, a product of Geo. T. Schmidt, Inc., 4100 Ravenswood Avenue, Chicago, Ill., will also mark parts of varying thicknesses without resetting for depths.

The machine will mark with solid flat dies, solid knurls or interchangeable type in flat type holders or knurls. The die or knurl is attached to a slide that is operated by means of an electric motor, the required pressure for the indentation being obtained from the shop air line through a cylinder at the back of the machine. A foot pedal at the front of the machine operates both the power clutch and air valve simultaneously, giving the operator freedom of both hands.

Flats or irregular surfaces up to 6 in. thick or round pieces up to 6 in. diameter can be marked in this machine. The die stroke is 5 in. and the table can be raised by hand 5 in. or by air from ¼ in. to 4 in. as ordered. The pressure is adjustable from 2,000 to 16,000 lbs, at 60 lbs. line pressure. The table is 6x12 in. with six ½-in. tapped holes. Air pressure required is from 30 to 100 lbs. and power is supplied through a 1 h.p. 1750 r.p.m motor. The carriage speed is 20 strokes per minute.

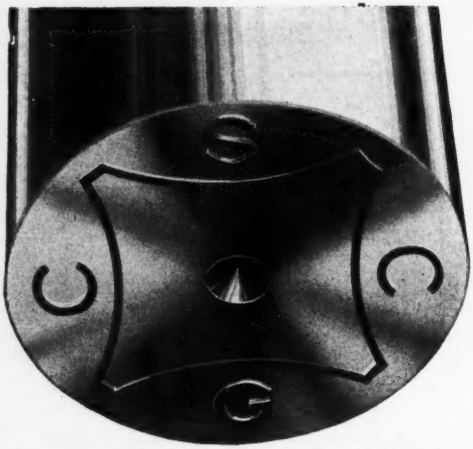
The height of the machine is 56 in. floor space required is 36x25 in., and the weight is 1400 pounds.

Williams "Agrippa" Tool Holde

The illustration shows a new style o tool holder, known as the "Agrippa which is now being marketed by J. H Williams & Co., 77 Spring Street, New

Williams "Agrippa" Tool Holder

York, N. Y. The high speed steel formed cutter assures threads that fit perfectly since to resharpen the cutter it is necessary to grind the top face only. Thu the correct form and angle are retained The cutter is ground to an included angle of 60 deg. and is backed off fo proper clearance. A hardened set screw bearing against the rear flat edge, which is eccentrically formed, provides not only positive but highly accurate adjustment



Be sure of this mark on the shafting you purchase . . . . . .

It is your POSITIVE ASSURANCE of accuracy, "Mirror Smooth" finish, straightness and ready machinability.

Send for Catalog "T"

TOLERANCES

SPECIAL
(Any Diameter)
LIMITS ± 0.0005"

or any other total tolerance of 0.001"

STANDARD

Small Dia. { +0.000" −0.002"
Large Dia. { +0.000" −0.003"

"Quality Shafting for over 50 Years"

CUMBERLAND STEEL COMPANY
CUMBERLAND, MARYLAND, U. S. A.

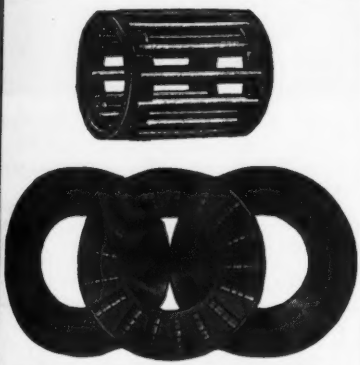
• NEW An Inexpensive ABRASIVE BAND GRINDER . . .

"Built Like a Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on the belt. Ball bearing throughout, equipped with **ALEMITE LUBRICATION**, complete with grease gun.

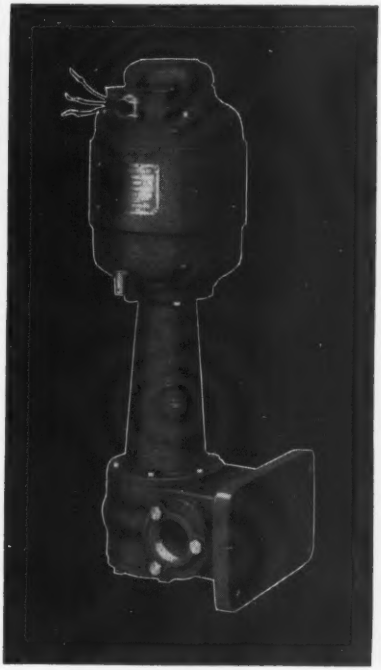
Write for illustrated folder on this and other styles and sizes.

HORMEL-M GRINDER
WALLS SALES CORP.
98 WARREN ST. NEW YORK, N. Y.



BALL THRUST BEARINGS
ROLLER THRUST BEARINGS
JOURNAL ROLLER BEARINGS
Special Bearings Made to Order.
Send Sketch or Sample for Quotation.
Catalog Upon Request

THE GWILLIAM CO.
358 Furman St., Brooklyn, N. Y.



RUTHMAN
Gusher Pumps
for
MODERN MACHINE TOOLS

It is significant that more than 80 machine tool builders install Ruthman Gusher Coolant Pumps on original equipment. Ruthman Pumps are designed and built by specialists in manufacturing coolant pumps ONLY. It will pay you to investigate the advantages of Ruthman Gusher Pumps. Write for details.

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THE RUTHMAN MACHINERY COMPANY
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ALL INDUSTRY DEPENDS ON

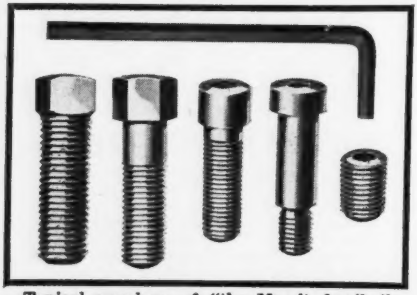
Mac-its

PRONOUNCED "MACK-ITS"

. . . . . FOR VARIETY

The original Mac-it idea . . . of making "the strongest screws in the world" . . . was applied to the first Square Head Set Screws, designed and built as far back as 1910. The same idea has also inspired all of the numerous other Mac-it Quality Screw Products which make up **the only complete line of Alloy Steel Heat-treated Screw Products** ever placed on the market by a single manufacturer! This means VARIETY — a full range of stock screw items, from which to select your immediate requirements when ordering.

Make the Mac-it test—sent free on request.



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The holder is available in two sizes, de ignated as No. 150 and 151.

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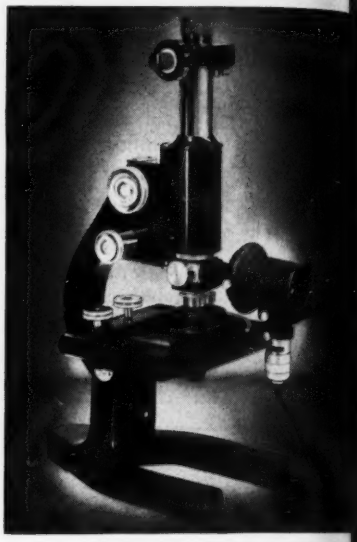
Exclusive distribution of the Baus & Lomb Electroplaters' Microscope the electroplating industry has be



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taken over by Hanson-Van Winkle-Mu ning Co., Matawan, N. J.

Inexpensive, simple and rugged in co struction and easy to operate, th microscope makes it possible for t plater to determine the exact thickne

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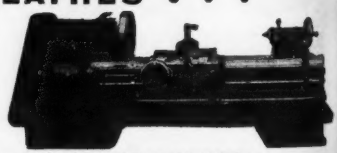

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ANGLE TOOL
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REDUCE GRINDING COSTS

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"Two Lipped"

"Spiral Two Lipped"

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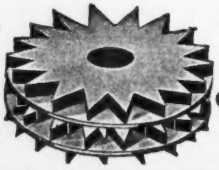
We make all types of Dressers and Cutters



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HI-SPEED
END MILLS

Superior quality produced by methods accumulated thru many years of fine tool designing and manufacturing assure you of—Maximum Production—Higher Speeds—Faster Feeds—Smoother Finish.

Send for Catalog

PUTNAM TOOL COMPANY
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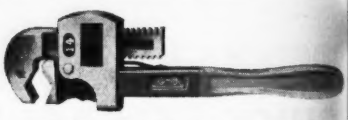
of the plate at any desired place. It thus possible to rack work in such way as to secure a more even plate a to materially reduce rejects and the a tending stripping and replating oper tions.

The instrument, which magnifies such an extent that a plate 1/100 of a inch thick appears to be four inch thick, consists of a monocular micr scope stand (H type) equipped wit both coarse and fine adjustments, a achromatic objective, a Filar microme eyepiece, a vertical illuminating unit f lighting the specimen and a mechanic stage to facilitate locating the specime in the field of the optical system.

Thickness is measured by adjustin the eyepiece by means of the drum o the side until the cross line lies ov one boundary of the plate. Note th reading on the drum. Then by turnin the drum the cross line is moved to th other boundary. The number of div sions through which the drum has bee moved gives the thickness of the fil directly in units of .00001-in. Specimen are prepared for measuring as in th metallographic laboratory.

"No-Mar" Wrench for Hex Fitting

The Greenfield Tap & Die Corp Greenfield, Mass., has announced a ne type of pipe wrench for use on hex



No-Mar Wrench for Hex Fittings

agonal pipe fittings. This wrench which combines the ease of operation a pipe wrench with four-bearing No Mar jaws, is ideal for use on chromium nickel-plated and brass valves, fitting

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Diamond Radii Dressers

HERE is a 45° angle lapped radius point. This tool, together with many different types of natural pointed radius diamond pointed tools, offered at prices ranging from

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In Master Motors you get the plus value of pleasing symmetrical appearance which makes them an attractive addition to any machine. Of course, underneath the good looks they have the heavy duty construction, the built-in stamina that makes it possible for them to stand up and take it. Rugged semi-enclosed frames, oversize shafts, extra large bearings, specially insulated windings . . . all mean added years of satisfaction on even the hardest jobs. Get what you pay for in motor stamina and motor performance . . . and the added value of attractive appearance. Call a Master Engineer.

THE MASTER ELECTRIC COMPANY
DAYTON OHIO U S A

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Steel Bodies — Lighter, handier, stronger, more power, more holes . . . priced 20% lower type for type, over-capacity—Try to stall a new SpeedWay. Cut time and cost on innumerable jobs, have a thousand uses. See the SpeedWay before you buy.

More Drill for the Money

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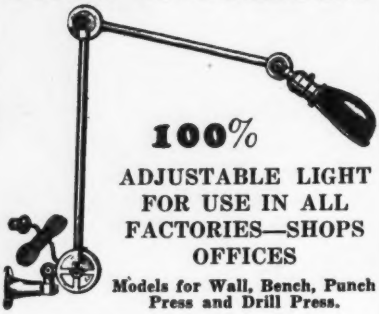

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Models for Wall, Bench, Punch Press and Drill Press.

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LOTS OF SIX $2.90 each

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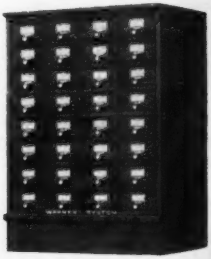
2504 W. MONROE ST. CHICAGO, ILL.

unions and bonnets. The four fl bearing surfaces take hold with a non-slip grip, which is not only an elemen of safety for the user, but also prevent crushing or marring the fitting an breaking down the corners. The wrench has proved very valuable for use on fittings such as are used on fire and wate department equipment, breweries, creameries, power plants, etc.

The wrench is supplied in 8-in. 10-in., 14-in., 18-in., 24-in. and 36-in sizes with forged steel handles.

Warren "Economical" Section Cabinets

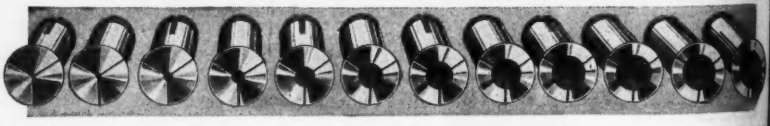
J. D. Warren Mfg. Co., 468 Mill Street Montpelier, Ohio, is now marketing a line of tool and small parts cabinets in a variety of designs, one of which is shown in the illustration herewith. The



Warren No. 1524 Economical Sectional Tool or Parts Cabinet

framework of the cabinets is of thoroughly seasoned white oak and the cabinets are finished in Medium Tavern Oak Finish. The cabinets are made of the sectional, interchangeable unit system; thus all cabinets are 27 in. high 25⅜ in. wide, and 15 in. deep. They can be used singly or assembled in any number of units either side by side

RIVETT DRAW-IN COLLETS AND CHUCKS



All lines of "Rivett Mark" Collets including Hendey, Cataract, Seneca and Rivett Styles can now be purchased from the following stocks:

CHICAGO
R. E. Ellis Engineering Co.
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Chas. A. Strelinger Co.
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LINLEY NOISELESS ROTARY RIVETING MACHINES

Assure Peak Production and Lower Maintenance. Rigid and Powerful. Bench and Floor Types. Motor or Belt Driven. There is a Linley machine for every riveting job.

Send Samples of your Work and we will furnish accurate estimate of production and quote cost of equipment.

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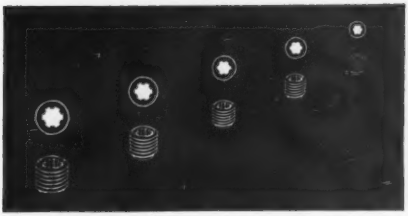

SAVE

assembling time

One advantage of the fluted socket design, to be found only in Bristo Screws, is the snug fit with which the wrench grips or holds the screw. This makes for easier handling,—also faster assembling, particularly in the very small sizes which Bristo design alone makes possible. There are as many as five sizes less than a quarter-inch in diameter. The Bristol Company, Waterbury, Connecticut.

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TRADE MARK REG. U. S. PAT. OFF.

SOCKET HEAD SET AND CAP SCREWS

SHORT RUN STAMPINGS

A process eliminating necessity of making expensive dies.

ALSO PRODUCTION STAMPINGS

We specialize in building mechanical devices. Write for estimates.

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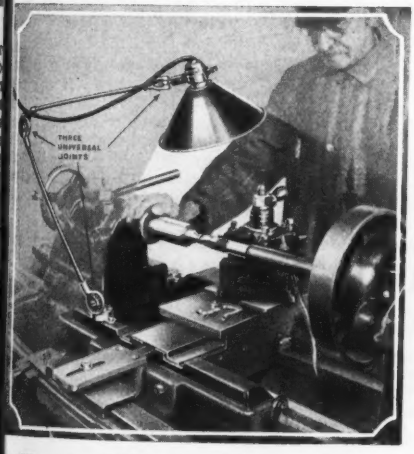

Readily and rigidly mounted on machine, bench, wall, or drafting table.

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- **COMPLETELY UNIVERSAL.** Light quickly spotted on work from any angle.
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- **LOW PRICE** with discounts for quantities. Send for descriptive circular with latest discount schedule.

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MEADVILLE, PA.

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IN STRAIGHT OR
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HOLES can be cut Quickly with YOUR Arbor Press and Our Cutters.
Bulletin on Request.
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Standardized Die Sets, embodying many exclusive features, and a listing of more than 95,000 stock sizes, afford a service that is unsurpassed.
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one on top of another as desired. T use of a removable shelf and me shelf supports makes it possible to terchange any two rows of 2½-in. hi drawers with one row of 5⅝ in. hi drawers.

All drawers are equipped with pu and card frames so that cards may attached as shown in the illustrati Drawers can be furnished with or wit out partitions as desired. The cabin can be supplied with a sectional su base as illustrated, or with a sectio sanitary base which is 15 in. high. T sanitary base stands on four square o legs, making it possible to clean unde neath.

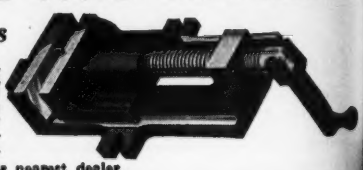
SpeedWay "Flea Power" Motor

The SpeedWay Manufacturing Co pany, 1825 52nd Avenue, Cicero, I has added a new series of 110 volt h

SpeedWay 110 Volt Back Geared "Flea Power" Motor

duction and series wound back gea motors to its "Flea Power" line. T new motors measure less than 3x3x in. with built-in speed reducers. Th differ from the skeleton motors of th line in that they are self-encased wi cast steel end bells and the inducti types are air-cooled with a small rot

ELIMINATE SPECIAL AND COSTLY JIG FIXTURES
By Using Yost Drill Press Vises
They are heavily constructed and very compact. Three flanges on the base permit easy attachment to machine or drill press table. A "V" shaped slot milled in the movable jaw permits a positive locking of vertical work. The ease and simplicity in operating makes this tool an indispensable factor in the execution of drill press operations.
Write us for circular "H", giving us name of your nearest dealer.
YOST MANUFACTURING COMPANY, MEADVILLE, PA.



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ACE SPOT WELDERS

1,200 WELDS PER HOUR
Continuously on 24 Ga.
Welds from 24 to 16 Ga.
For production or general utility. Model 50.

PRICE, ONLY $47.50

Sample welds and literature on other sizes upon request.

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WALDRON SILENT STEEL Gears

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Machine Counters

There is a *Productimeter* for counting or measuring the output of almost any production machine.

- Stroke and Revolution counters in several types and sizes adapted for machines, conveyors, hoppers, engines, scales, looms, presses, pumps, stokers, compressors, etc.
- Quick Reset counters for rapid, accurate handling of short runs.
- Predetermined counters for giving a signal or stopping machines when a pre-set total is reached.
- Double Deck counters recording current runs and daily totals.
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Tell us what you want to count.

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Ames Jumbo Gauge

With 4 inch dial graduated in 1/1000". Heavy duty. Deep throat.

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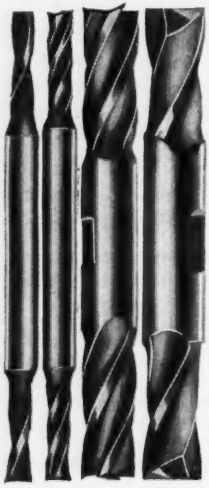

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Single and Double

END MILLS

THEY shear cut the metal instead of the old way of cutting. They leave that smooth finish you want. It is the way they are ground. Give them a trial and see for yourself. You get two for the price of one.

Send for a new catalog showing other sizes and styles.

Progressive Tool & Cutter Co.

FERNDALE MICHIGAN

blower. The built-in gear box permits innumerable speed combinations for the two shafts, which may have different speeds.

The motor has feet to facilitate mounting and may be either horizontal or vertical. Provision is made for an oil reserve for long continuous operation. The manufacturer claims unusual dependability for little motors.

Johansson No. 2 Gage Block Set

The illustration shows the No. 2 Johansson Gage Block Set which is now being marketed by Johansson Division, Ford Motor Company, Dearborn, Mich.

Johansson No. 2 Gage Block Set

igan. This set consists of 35 blocks and 3 accessories, with which 80,000 different sizes of gages can be obtained in consecutive steps of 0.0001 in. from size 0.1 in. to over 8.000 inches.

The gage blocks can be furnished in accuracies of eight millionths inch, four millionths inch or two millionths inch

***For*—large volumes**

—high pressures

—use Nos. 53 and 55

in supplying oil under pressure for hydraulic operations of machines.

Helical Gears and Ball Bearings

insure quietness and dependability.

BROWN & SHARPE MFG. CO.,

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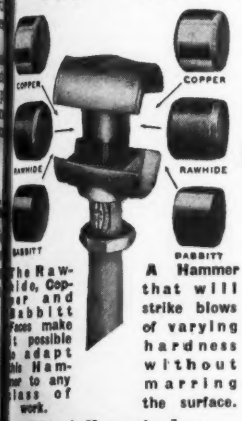

The Rawhide, Copper and Babbitt Faces make it possible to adapt this Hammer to any class of work.

A Hammer that will strike blows of varying hardness without marring the surface.

THIS IS POSSIBLE WITH THE

BASA HAMMER

WITH REMOVABLE FACES

Faces Cannot Rattle in Head, or Fall Out

The clamping jaws of the "BASA" Hammer can be set up to take care of shrinkage or wear of the Faces.

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GREENE, TWEED & CO.

Sole Manufacturers

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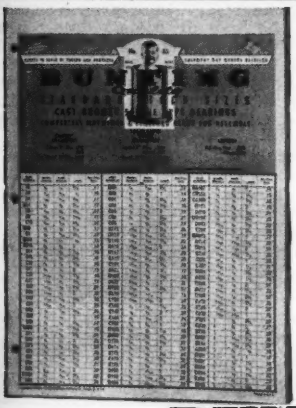

THOUSANDS of users find valuable specific cost reductions in Bunting Bronze Standardized Bearings. There are over 500 sizes of these bearings completely machined and finished, ready for assembly. Any quantity of any size can be obtained instantly from stock. Let us send you a catalog giving sizes, prices and complete data.

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Branches and Warehouses in All Principal Cities

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BUNTING Quality

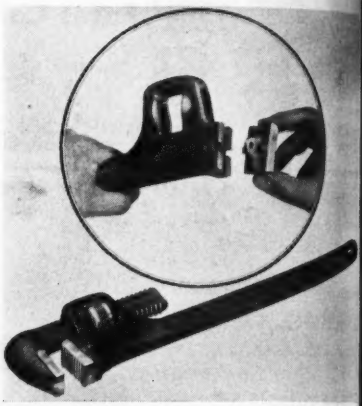
BRONZE BUSHINGS • BEARINGS
MACHINED AND CENTERED BRONZE BARS
ANTI-FRICTION METAL

per block up to one inch of length and per inch of length on longer blocks. As usual, the block are furnished in a nicely finished hardwood case.

Walworth Improved Pipe Wrench

An improved pipe wrench with features said to result in added years of useful service has recently been announced by the Walworth Company, 60 East 42nd Street, New York, N. Y. A renewable lower jaw of hardened steel with cross tongues seating into cross slots in the handle, is locked in place so as to eliminate backward shear on its pin and prevent loosening in service. However, the jaw can be easily renewed when required.

A new type of spring is said to have



Walworth Improved Pipe Wrench

a much longer life and easier action. When necessary, it may be replaced without the use of tools. Other new features include a more comfortable handgrip, larger capacity in the popular 10-inch size, reduced weight and narrower jaws in the 24-inch size, a Parkerized rust-proof finish and a cadmium plated nut.

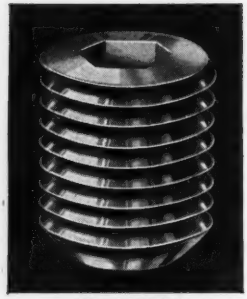
The wrench is of drop-forged steel with its housing forced integral with the handle, heat treated for maximum strength. Complete specifications, sizes

New Uses . .

Socket heads screws find many more uses today because of the streamline design of modern machines and parts. FIBRO FORGED Screws—the new process screws—give Unfailing Performance.

HOLO - KROME

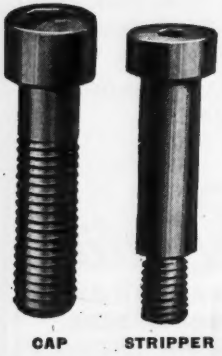
BRISTOL, CONN., U. S. A.



SET SCREWS

Be sure you have a copy of the New Holo-Krome Catalog. If not, write to Dept. "H".

Make your own test. Ask for enough screws. Gladly sent Free.



CAP STRIPPER

FIBRO FORGED TRADE MARK SCREWS

PIPE PLUG

Lathe Turret Head . . . $30.00

Especially adapted to lathe work . . . holds 6 various ½" shank tools at one loading, thereby replacing drill chucks. Saves its cost quickly. Write for descriptive circular.

TOM'S MACHINE COMPANY

410 Niagara St., Niagara Falls, N. Y.

For
YOUR Punch Press

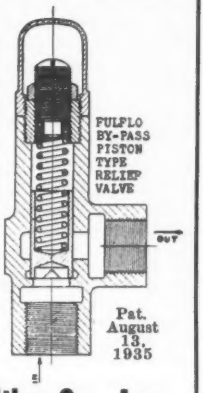
Every punch press on second operation work needs a guard. Protect your operators with the D. & M. Automatic Punch Press Guard. It is adaptable to all punch presses and operates efficiently and dependably.

Write for Bulletin and Prices. Try One for 30 Days at Our Expense.

TAYLOR-SHANTZ CO.
480 St. Paul St. Rochester, N. Y.

FULFLO Non-Chattering By Pass Piston Type **Relief Valve**

THIS valve is made in pipe sizes from ⅜ to 3" and is suitable for pressures from 10 lbs. to 1,000 lbs. Adjustment can be made by removing cap and turning adjustment screw at top of valve. The cylindrical piston seat closes off the port in a shearing manner, and does not seat abruptly against the body of the valve, thereby, relieving a pounding or chattering noise as ordinarily caused by standard valves using a disc seat.



Fulflo Specialties Co., Inc.
BLANCHESTER OHIO

MOORE TRUE PRECISION JIG BORER

When you buy a Moore True Precision Jig Borer you are investing in a thoroughly modern and dependable toolroom machine. It is extremely accurate and easy to operate. Features include preloaded completely enclosed ball bearing spindle, five spindle speeds, hardened, ground, and lapped quill, micrometer reading to one-tenth of a thousandth of an inch, table travel 9⅛"x14¼".

An outstanding value at a moderate price.

Write for details and quotation.

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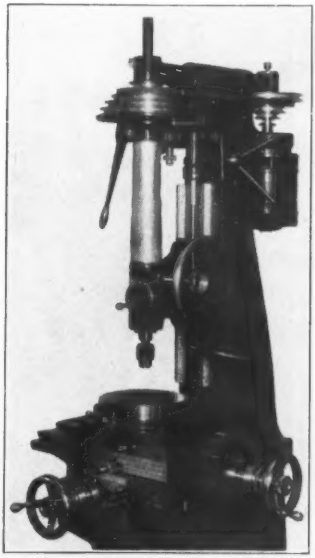


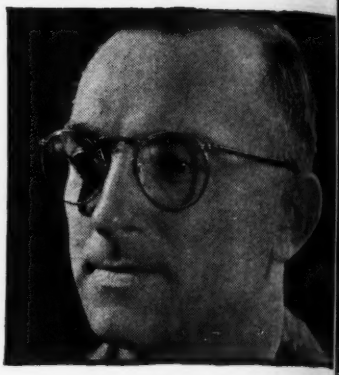
etc., may be obtained by addressing the facturer.

No. F3100 Ful-Vue Goggle

A new goggle, exactly like the well-known Ful-Vue spectacles in its appearance and in many of its design features, has just been announced by American Optical Company, Southbridge, Mass.

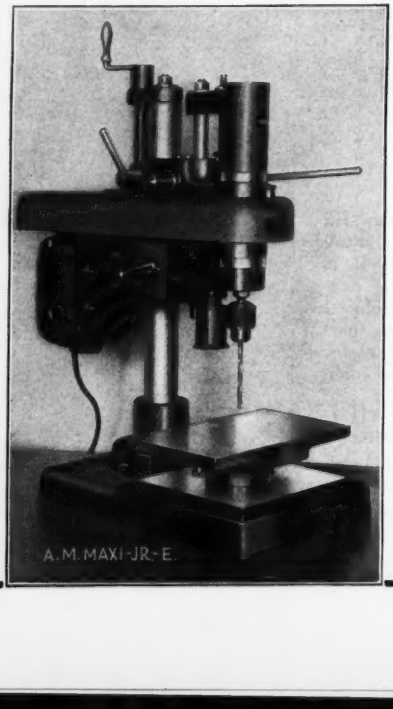
Chief advantages of the new F3100 Ful-Vue goggle, as stated by the manufacturer, are its handsome appearance and its comfort, features which are expected to make it easier to enforce goggle programs. For the customary nose-piece, the new goggle substitutes pearl full-rocking nose-pads which distribute the slight weight of the goggle on the sides rather than on the top of the nose. Ear-pieces are of flexible cable, completely insulated, so that no metal touches the skin at any point. As on the Ful-Vue spectacle frames, the ear-pieces are set high on the rims, removing every obstruction to full side vision and adding to the goggle's good-looks.

Comfortable fitting is made easy by the adjustable nose-pad supports and by the universal swivels that allow the nose-pads to conform automatically to the contour of the nose.



No. F3100 Ful-Vue Goggle

The F3100 Ful-Vue Goggle is fitt with the new 6-Curve Super Armorpl Lenses, capable of withstanding blo approximately twice as heavy as th which fracture standard lenses. T domed surface of the lens is declar to be exceptionally effective in deflecti



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Major Improvement In Timken Bearings

Now being applied to Timken Bearings as rapidly as the special equipment required can be built and installed, is a major improvement in surface finish, termed "Mirror Finish." Even the standard finish on Timken Bearings is smooth to the delicate eye and finger nail test, which can hardly determine any irregularities in the finely ground surface, but this new "Mirror Finish" is infinitely smoother.

The accompanying photographs show both standard and "Mirror Finish" surfaces magnified 500 times in a vertical plane to emphasize even the slightest irregularity. Even though the measurements were made with equipment capable of measuring in terms of a millionth of an inch (0.000001"), it was impossible to find a flaw in a "Mirror Finished" Timken Bearing surface.

To achieve this remarkable uniformity of finish on the operating surfaces of Timken Bearings, years of experimental work have been required. First of all a method of measuring surface finish was required, which was found in the "Profilograph".

The "Profilograph" consists essentially of a fine diamond point which acts as a tracer or detector, moving over the surface of the specimen. To this is connected an optical system which magnifies the movement of the detector. In order to record even the most minute irregularities in the finely ground sur-

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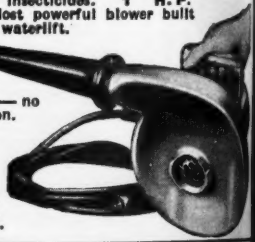

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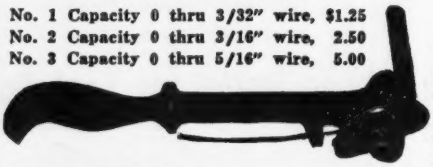

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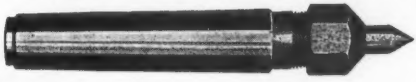

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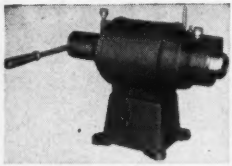

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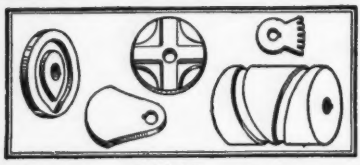

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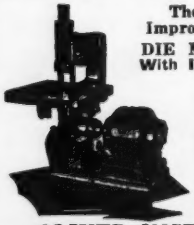

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faces of Timken Bearings, it was nec-
sary to apply a vertical magnification
2000 times to the system. The trace
the detector point as magnified is phot
graphed as a permanent record.

By comparing Figures 1 and 2 w

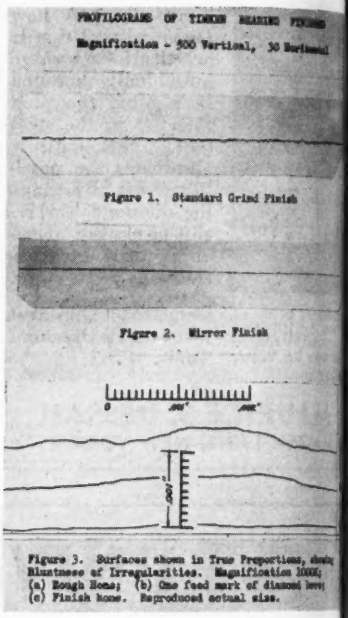

Figure 3. Surfaces shown in True Proportions, showing Minuteness of Irregularities. Magnification 1000X; (a) Rough Hone; (b) One feed mark of diamond hone; (c) Finish Hone. Reproduced actual size.

Figure 3, a still more striking exam
of the extent to which the finish
Timken Bearings has been perfected
be noted. Figure 3 shows profilogra
of surfaces in their true proportio
magnified 1000 times. The upper tr
(a), shows a rough hone finish,
middle trace (b) a single feed mark

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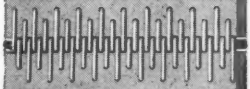

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a diamond bore, and the lower tr
(c) illustrates the finish secured
finish honing. Thus it will be seen th
the normal irregularities of finished m
faces are essentially blunt, but wh
compared to the smoothness of a "M
ror Finished" piece, even the finest wo
heretofore possible seems rough.

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(lower view) one of the new free-cutti
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machine, the Aluminum Company
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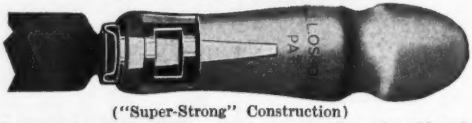

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alloys and in two tempers, providing a choice of four materials. One of the alloys in one tamper is said to have properties comparable to those of duralumin and free-cutting brass, both in strength and toughness. In the other temper, involving aging at slightly elevated temperatures following a solution heat treatment, very high yield, tensile and shear strengths were obtained, although at the expense of some elongation and toughness.

In some applications the free-cutting aluminum can be used with the same machine equipment used for machining free-cutting brass rod with no change in machine set-up, speeds, feeds, or tool angles, indicating that the new alloys are capable of adapting themselves to extremely high speed production.

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Elongation.....20-25% in 2 in.
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The addition of "Doler-Brass" to the line of trade marked alloys marketed by this company brings a wide range of copper-base alloys in die cast form to the designing engineer.

Francke Flexible Coupling Catalog

The John Waldron Corporation, New Brunswick, New Jersey, has published an attractive catalog describing and illustrating the important changes which have recently been made in the Francke Flexible Coupling. The new catalog has been issued coincident with the new sales policy recently inaugurated whereby Francke Flexible Couplings and Replacement Parts, formerly sold through General Sales Agents, are now offered direct by John Waldron Corporation, the original manufacturer. In addition to describing the important changes in design and materials, the new catalog gives complete tables of sizes for the various types, full directions for size selection and coupling service factors. Copies of the catalog together with list of lower prices, are available to plant executives.

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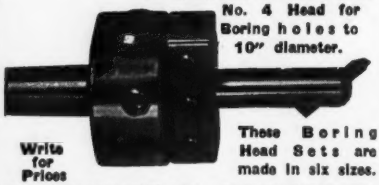

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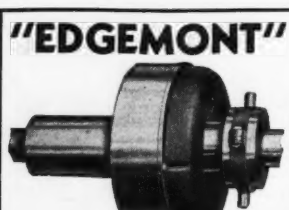

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